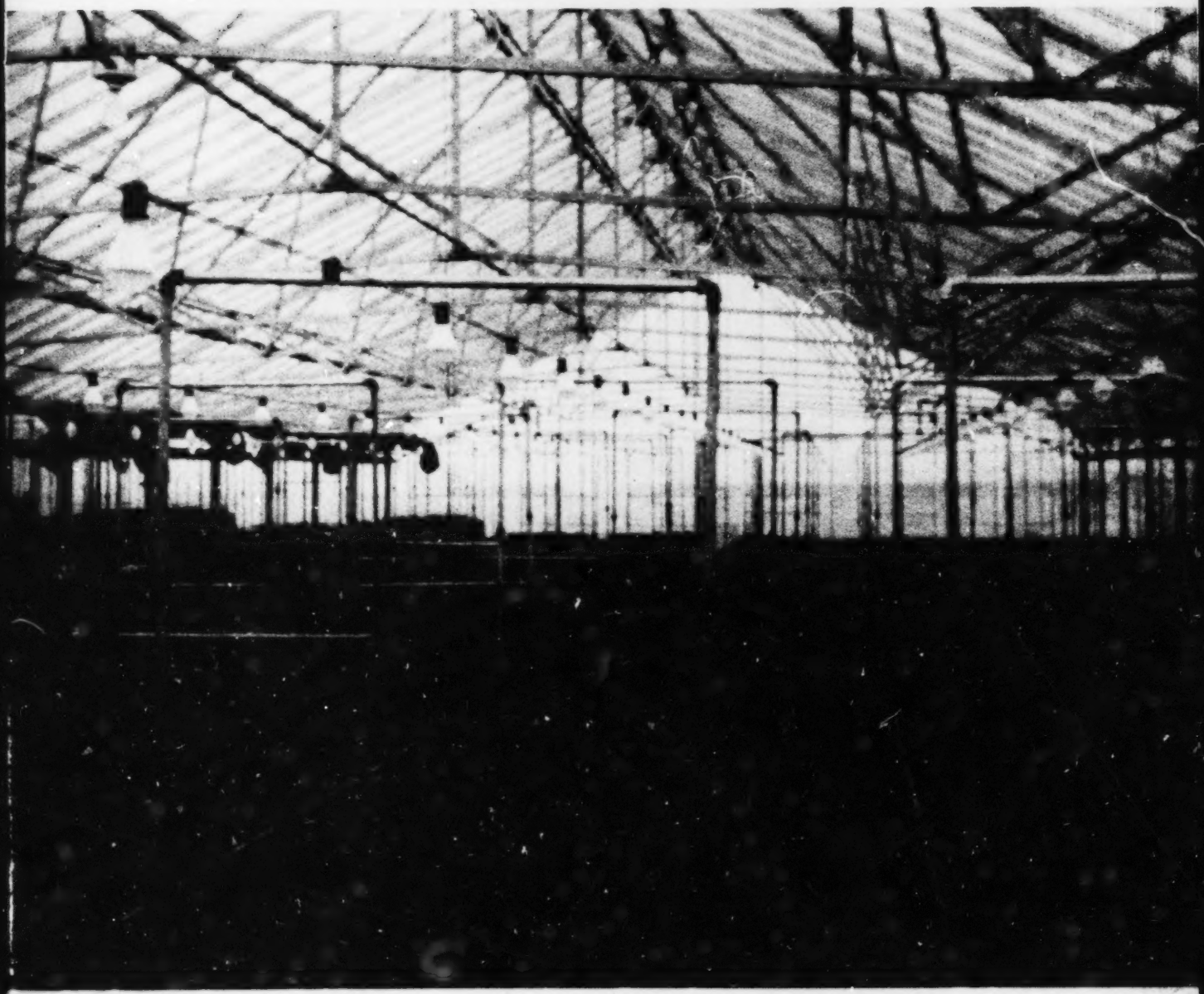
THE ECONOMICS OF PRODUCTION AND MARKETING OF GREENHOUSE CROPS IN ALBERTA 1983-84



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THE ECONOMICS OF PRODUCTION AND MARKETING OF GREENHOUSE CROPS IN ALBERTA, 1983-84

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SECTION I

INTRODUCTION

At the request of the Protected Crops Advisory Committee, a study of the greenhouse industry was undertaken to develop production costs and returns information for various greenhouse crops.

The greenhouse industry in the province has gone through several adjustments, therefore the need was felt to estimate costs based on current conditions so that the industry can change accordingly. The cost of natural gas and greenhouse supplies became major concerns in the 80's. The specific request for another study of the industry was made primarily to update some of the information compiled during the late 70's, and to evaluate the financial viability of the industry in the province. Because of changing economic conditions, previously compiled information on the greenhouse industry became more or less obsolete.

Significant increases in natural gas costs for heating greenhouses and the price of greenhouse supplies created some economic difficulties for greenhouse operations in the province. Realizing these difficulties the provincial government introduced an energy rebate program for the primary agricultural producers whereby greenhouse operators can receive assistance to a maximum of $4850 to supplement heating expenses.1

A survey of the greenhouse industry was undertaken during the 1978-79, 1979-80, 1982-83 and 1983-84 crop years to develop production costs and returns information for the major greenhouse crops and for various sizes of greenhouses.

Three reports, one each based on the respective crop year, were published and have been used as guidelines for greenhouse investment decisions. The reports highlighted the problems in production, marketing, transportation, availability of finance and other concerns of greenhouse operators in Alberta.

This report provides the most current information on greenhouse production costs and returns for the major greenhouse crops and by size of the greenhouse operation for the 1983-84 crop year. The study was carried out over two years (1982-83 and 1983-84) in order to obtain a better assessment of the industry.

Objectives of the Study

The following were the major objectives of the study:

1. determination of the structure of the greenhouse industry in Alberta
2. estimation of greenhouse production costs and returns by major crops
3. identification of the main factors influencing production and marketing of greenhouse crops in Alberta
4. identification of major problems experienced by greenhouse producers in Alberta.

1 The Primary Producers' Energy Rebate program was introduced in October 1982. Under this program a greenhouse operator could receive a maximum assistance of $4850 towards natural gas heating costs. The program was due to expire on December 31, 1984 but has been extended for another year.

The Study Sample

The questionnaire prepared for the previous study years was further modified to simplify data entry. It was used to obtain the required information from a selected sample of greenhouse operators across the province.

Twenty five (25) greenhouse operators were selected, with the assistance of the Extension Horticulturist at the Alberta Horticulture Research Center, Brooks, in order to obtain production costs and returns information for the 1983-84 crop year. Out of 25 only 21 greenhouse operations were surveyed. These greenhouse operators were able to provide complete records of their business. Two greenhouse operators provided incomplete records. Two (2) greenhouse operators were unable to provide any information on their operations. Therefore, in this report data from 21 greenhouse operators were used to meet the objectives of the study.

Method of Analysis

The technique used to analyze the data was "SPSS" (Statistical Package for the Social Sciences). SPSS is an integrated system of computer programs for the analysis of social science data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and offers the researcher a large number of statistical routines commonly used in the social sciences.[2]

After the completion of the questionnaire, data were reviewed to make sure that no information was missing from the questionnaire. Data were key-punched for analytical purposes.

Each greenhouse operation was analyzed separately and the participant received a detailed personalized report of his/her greenhouse. The study was divided into two groups, i.e., by the type of crop produced and by the size of the operation. This breakdown provided representative cost and return estimates related to the type of crop produced and size of the greenhouse operation.

2 Norman, H. Nie; Dale H. Bent and C. Hadlai Hull, Statistical Package For The Social Sciences, McGraw-Hill Book Company, New York, April 1971, pp. 1-3.

SECTION II

GREENHOUSE OPERATIONS IN ALBERTA

Although greenhouses in Alberta are scattered throughout the province, more than two-thirds of these operations are located in the south and south-central regions. The area around Medicine Hat is called the "greenhouse belt" of Alberta because of the Red Hat Co-op (a producer organization responsible for marketing cucumbers) and the large number of greenhouses in this area. Most greenhouse operations are located in cities and towns because of easy access to labour, marketing facilities, utilities and services necessary for the greenhouse operation. During the last several years, a few new greenhouses have been built at some distance from the major population centres because of very high land prices and taxes close to the major centres.

Survey of The Greenhouse Industry

According to a survey of the greenhouse industry in the fall of 1984, there were approximately 227 commercial greenhouse operations in Alberta with a total area of 533,558 square metres (5,645,040 square feet) or 52.5 hectares (130 acres).[1]

The comprehensive survey undertaken by the Alberta Greenhouse Growers' Association provided detailed information on the structure of the greenhouse industry in the province. It reported on the types of crops grown in greenhouses, heating systems, types of greenhouse material, marketing of greenhouse produce (wholesale and retail operations), and the greenhouse operator's concerns, etc.

The three regions with the largest greenhouse area in the province are Medicine Hat (31 per cent), Edmonton (23 per cent) and Calgary (23 per cent). The remaining 23 per cent of greenhouse area is scattered throughout the province from Peace River in the north to Lethbridge in the south. Table I provides information on the size of the greenhouse industry in the province. Table 2 classifies greenhouse operations by area (size of greenhouse operation). Figure I shows the distribution of greenhouses in the province.

According to the 1984 survey by the Alberta Greenhouse Growers' Association (AGGA), 32 per cent of the greenhouses have glass as a covering or glazing material, 41 per cent polyethylene, 24 per cent fibreglass and the remaining three per cent polycarbonate.

Besides this and other surveys, Statistics Canada also undertakes a survey of the greenhouse industry every year to identify the number of commercial greenhouse operations in the province, crops grown and the total output of crops produced in a controlled environment.

In 1980, all greenhouse operations in Alberta were contacted by Statistics Canada and only 105 firms reported on their operations. The area reported by these firms was 2.826 million square feet which is about half of the area reported in the 1981 census. In 1981, the number of firms reporting on their operations decreased to 97 and similarly area reported declined to 2.385 million square feet. Although the number of firms returning Statistics Canada questionnaires further decreased to 92, the overall area reported by these firms increased to 2.680 million square

1 Robert B. Hughes, "Greenhouse Industry in Alberta", The Alberta Greenhouse Growers' Association, November 1984.

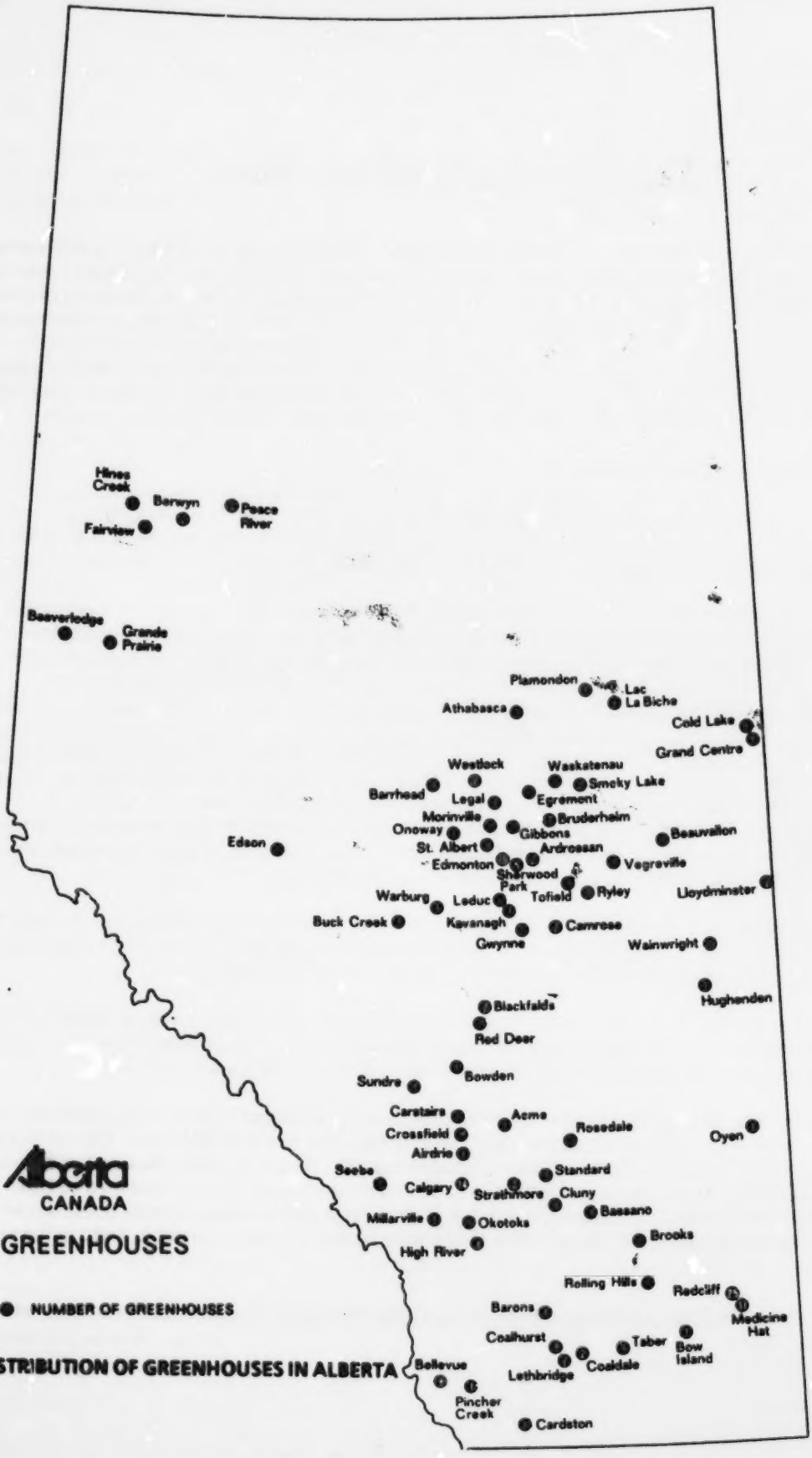

FIGURE 1: DISTRIBUTION OF GREENHOUSES IN ALBERTA

TABLE 1

DISTRIBUTION OF GREENHOUSE AREA BY MAJOR CENTRES, 1984

	Region	Area in Square metres (m^2)	Area in Square Feet (Sq Ft)	Per cent of Total
1.	Fort McMurray	836	9,000	0.2
2.	Grande Prairie	6 304	67,860	1.3
3.	Whitecourt	13 406	144,300	2.8
4.	Edmonton	109 475	1,178,390	23.1
5.	Bonnyville	4 543	48,900	0.9
6.	Lloydminister	3 883	41,800	0.8
7.	Red Deer	53 434	575,160	11.3
8.	Calgary	108 575	1,168,700	22.9
9.	Medicine Hat	146 465	1,576,550	30.9
10.	Lethbridge	27 479	295,780	5.8
	TOTAL	474 400	5,106,440	100.0

TABLE 2

DISTRIBUTION OF GREENHOUSE AREA BY SIZE OF OPERATION

Size of Operation	No. of Operations Surveyed	Per Cent of Total Surveyed
Less than 10,000 Sq ft	99	46.5
10,000 to 19,999 Sq ft	45	21.1
20,000 to 50,000 Sq ft	54	25.4
More than 50,000 Sq ft	15	7.0
TOTAL	213	100.0

feet. In 1983, the greenhouse firms reporting on their operations declined to 81, which showed a considerable decrease in area of greenhouses in Alberta. Table 3 provides greenhouse area by structure (glass and plastic) and sales of greenhouse produce as reported by most of the commercial greenhouse growers in the province.

The Statistics Canada survey of the greenhouse industry reported average area per firm (Table 3), both under glass and plastic, at 26,916 square feet in 1980. It decreased to 24,589 square feet per firm in 1981, but increased to 29,132 square feet in 1982. In 1983, average area per firm was 29,373 square feet, a considerable increase over 1981. This increase in average area per firm can be attributed to the large greenhouses reporting on their operations when compared to previous years. In 1983, the number of firms reporting on their operations was down to 81, the lowest number of firms reporting during the last several years.

Gross sales of greenhouse produce as per the Statistics Canada survey (Table 3) amounted to $15.7 million in 1980 which increased to $17.8 million in 1981. Average sales per firm were $149,200 in 1980 and $183,182 in 1981. Total sales of greenhouse produce increased to $19.9 million in 1982 and decreased to $15.4 million in 1983 owing to a smaller number of firms reporting on their operations compared to earlier years.

Average sales per firm increased to $183,182 and $215,915 in 1981 and 1982, respectively. However, average sales per firm declined to $190,613 in 1983. Average sales per square foot were $5.54 in 1980, increasing to $7.45 in 1981, $7.41 in 1982 and decreasing to $6.49 in 1983. Details regarding total area under glass and plastic, and total sales of vegetables, bedding plants and ornamental flowers in Alberta for the years 1980 to 1983 are presented in Table 3.

The Statistics Canada surveys do not provide a complete picture of the greenhouse industry in Alberta because a large number of growers failed to provide the required information. Greenhouse operators should make an effort to complete the one-page questionnaire as it is to their advantage to know the size of their industry and the types of crops produced. If such information were available, it would assist in planning crops which can be marketed easily in order to maximize returns.

Greenhouse Area Surveyed By Type Of Structure

The size of the greenhouse operations surveyed for the 1983-84 study ranged from 11,400 to 155,372 square feet (1 059 to 14 434 m^2). Distribution of the greenhouse area under glass, fibreglass and plastic is presented in Table 4. Group I represents north and north central Alberta (regions 3, 4, 5 and 6), and Group II represents south and south central Alberta (regions 1 and 2). For the 1983-84 study, 25 greenhouse operations were selected and only 21 were able to provide the required information.

Figure 2 shows the various regions of the province and grouping of greenhouses by regions. Growth in the greenhouse industry has been modest during the last few years. A few new greenhouses have been built and additions have been made to the existing facilities. Although there have been some greenhouse closures, the overall size of the industry has increased. In Group I, the total area under glass was 52,000 square feet (4 831 m^2), about 16 per cent of the total greenhouse area surveyed in the north and north central regions. The greenhouse area under fibreglass and plastic amounted to 167, 512 square feet (15 562 m^2) or 52 per cent, and 102,143 square feet (9 489 m^2) or 32 per cent, respectively.

TABLE 3

GREENHOUSE AREA AND SALES OF VEGETABLES AND ORNAMENTAL FLOWERS IN ALBERTA

Area of Glass & Plastic	1980	1981	1982	1983
No. Reporting	105	97	92	81
Total Area				
Sq Ft	2,826,145	2,385,114	2,680,166	2,379,178
m^2	262 557	221 584	248 995	221 033
Av/Firm				
Sq Ft	26,916	24,589	29,132	29,373
m^2	2 501	2 284	2 706	2 729
A. GLASS				
No. Reporting	57	51	48	36
Area Sq Ft	1,660,815	1,109,696	1,401,820	1,256,894
Area m^2	154 294	103 094	130 233	116 769
Av/Firm Sq Ft	29,137	21,759	29,205	34,914
m^2	2 707	2 021	2 713	3 244
B.PLASTIC				
No. Reporting	74	69	66	60
Area Sq Ft	1,165,330	1,275,418	1,278,346	1,122,284
Area m^2	108 263	118 490	118 762	104 264
Av/Firm Sq Ft	15,748	18,484	19,369	18,705
C.SALES				
No. Reporting	105	97	92	81
Total Sales ($)	15,666,039	17,768,633	19,864,213	15,439,669
Av/Firm ($)	149,200	183,182	215,915	190,613
Sales/Sq Ft	5.54	7.45	7.41	6.49
Sales/m^2	59.67	80.19	79.78	69.85

Source: Statistics Canada, GREENHOUSE INDUSTRY, Cat. No. 22-202, Annual, 1980-83.

In Group II (south and south central regions), the number of glass greenhouses belonging to the 12 study participants was somewhat different from that in Group I. About 74 per cent of the area surveyed in this group was under glass compared to 16 per cent in Group I. Area under fibreglass and plastic were 22 per cent and 4 per cent, respectively. Greenhouse operators in Group II reported 397,860 square feet (36 962 m^2) of which 296,860 square feet (27 579 m^2) was under glass, 86,000 square feet (7,990 m^2) under fiberglass and 15,000 square feet (1 394 m^2) under double plastic.

Greenhouses surveyed for the 1983-84 greenhouse crop year occupied 719,515 square feet (66 844 m^2), of which 348,860 square feet (32 410 m^2) or 49 per cent was under glass, 253,512 square feet (23 552 m^2) or 35 per cent under fibreglass, and 117,143 square feet (10 883 m^2) or 16 per cent under plastic. The average area per grower in Group I was 35,739 square feet (3 320 m^2) compared with 33,155 square feet (3 080 m^2) for Group II. The average area for the entire study

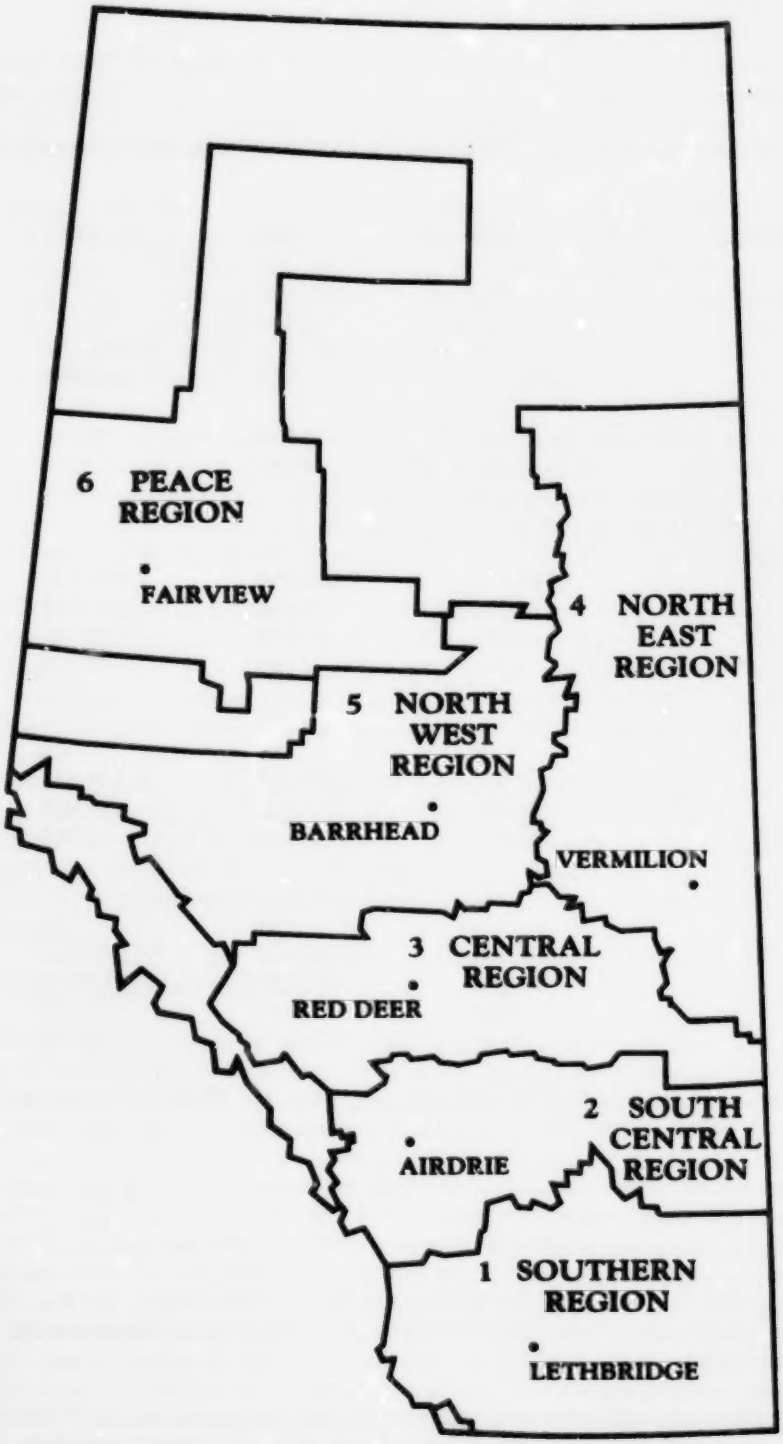

FIGURE 2: ALBERTA AGRICULTURAL REGIONS

sample was 34,263 square feet (3 183 m²). The southern part of the province had more glass structured greenhouses than the north and north central areas. Greenhouses surveyed for the 1983-84 crop year are classified as to structure in Table 4.

Physical Characteristics of Greenhouses

Greenhouses in Alberta range from small sash roof "lean-to" houses constructed of a wood-frame sash to large modern steel frame houses with truss supported roofs. Most new greenhouses are of steel, wood or masonry construction covered either with glass, fibreglass, double plastic, or a single layer of plastic. A 1984 survey by the Alberta Greenhouse Growers' Association reported over 5.1 million square feet (474 400 m²) of greenhouse area in Alberta. The number of greenhouse operations surveyed was 213. Another 14 greenhouse operations could not provide any information.

During the last 5-6 years, a new concept known as "HYDROPONICS" has emerged in the Alberta greenhouse industry and is being used in the production of tomatoes, cucumbers and lettuce. Although this greenhouse crop production technique has been in use for quite some time in the States, Eastern Canada and British Columbia, it was not until 1978-79 that it was introduced in Alberta.[1] Over a dozen greenhouse operations in Alberta use the hydroponic method of producing greenhouse crops, especially tomatoes. Several growers are evaluating the use of this technique for producing lettuce and other greenhouse crops.

The major internal features of greenhouse systems in Alberta are as follows:

i) Heating Systems

A year-round greenhouse operation is heated with natural gas/steam/propane/coal to maintain optimum temperatures for crops grown during the winter months. Some vegetable producing greenhouses operate 9 to 10 months of the year and close down during November and December. Almost all of the greenhouses in southern Alberta are heated by natural gas burners, and when combined with stove pipes these burners provide sufficient heating through natural air movement. Greenhouses in northern Alberta are equipped with natural gas boilers and hot water pipes for heating. All boiler heating systems have automatic temperature control devices.

In addition to heating systems, most greenhouses in Alberta are equipped with a pad and fan cooling system. The cooling system is essential if temperatures are to be lowered during the hot summer months.

Table 5 presents the various types of heating systems used in greenhouse operations in the province. In some cases one grower has more than one heating system.

1 "HYDROPONICS" is a crop production technique in a controlled environment which replaces soil with a sterile growing medium and automatic watering/feeding system generally meaning faster growth, higher yields, less work, more precise control of watering and feeding, fewer diseases, a cleaner operation and better quality produce. On the negative side, initial installation costs are higher and a greater degree of technical skill is required to maximize results.

TABLE 4

GREENHOUSE AREA BY THE TYPE OF STRUCTURE FOR THE GREENHOUSES SURVEYED, 1983-84

			Greenhouse Area - Square Feet and m^2				
		No. of Greenhouses Surveyed	Glass	Fibre Glass	Plastic	Total	Average Per Grower
Group I[1]	square feet	9	52,000	167,512	102,143	321,655	35,739
	m^2		4 831	15 562	9 489	29 882	3 320
Group II[2]	square feet	12	296,860	86,000	15,000	397,860	33,155
	m^2		27 579	7 990	1 394	36 962	3 080
TOTAL	square feet	21	348,860	253,512	117,143	719,515	34,263
	m^2		32 410	23 552	10 883	66 844	3 183

(1) Group I represents north and north central regions (3, 4, 5 and 6).

(2) Group II represents south and south central regions (1 and 2).

TABLE 5

HEATING SYSTEMS IN ALBERTA GREENHOUSES

System	No. of Growers	System	No. of Growers
1. Gas Furnace	121	8. Infrared	2
2. Steam	65	9. Oil Furance	2
3. Hot Water	29	10. Electric	2
4. Coal	8	11. Waste Heat	2
5. Propane	6	12. Kerosene	1
6. Wood	6	13. Bio-therm (Hot Water)	1
7. Stove Pipe Heater	5		

ii) Watering Systems

The watering of ground beds is usually done by the use of soaker hoses which run parrallel to each side of the bed. Bench beds and potted plants are usually watered with the use of chapin tubes. Other operations may utilize water supply pipes along with garden hoses.

iii) Supplementary Lighting

Very few greenhouses have supplementary lighting. Those that do, make use of ordinary lamps, usually five to six feet apart. Supplementary lighting is mostly used for producing chrysanthemums.

Greenhouse Crops

Greenhouses in Alberta produce many kinds of flowers, chrysanthemums, roses and geraniums being the most common potted plants. Outdoor flowers such a petunias and marigolds are also produced in these greenhouses. Some greenhouse operations concentrate on importing tropical plants which are acclimatized to Alberta before selling. The most commonly grown greenhouse vegetables are cucumbers, tomatoes, and lettuce. During the last few years, attempts have been made to grow peppers, eggplants, cauliflowers, cabbage and chinese vegetables, etc.

Table 6 lists the types of crops grown in greenhouses across the province. The only single crop greenhouses are ones producing vegetables. A few of these also grow bedding plants. A large number of greenhouses produce many kinds of greenhouse crops.

Greenhouses surveyed for the 1983-84 crop year were divided into three groups on the basis of the major crops grown. Nine greenhouses (43%) produced long-english cucumbers only. The remaining greenhouses (57%) produced bedding plants, potted and cut mums, poinsettias, foliage plants and roses, etc. Greenhouses producing different crops were in operation year round, whereas the vegetable greenhouses were in operation for about 10 months, i.e., February through November. Greenhouses producing bedding plants were in operation for about 5 months, February to June.

Greenhouse Production

The only data available indicating the value of greenhouse production in Alberta are the gross sales compiled by Statistics Canada through a survey of the industry. These sales amounted to $15.7 million in 1980, $17.8 million in 1981, $19.9 million in 1982 and $15.4 milion in 1983 (Table 3). From 81 to 105 firms reported their gross sales, which was significantly less than the total number of greenhouses in the province. The increase in gross sales from 1980 to 1982 could be attributed to higher prices received for produce and an increase in yield for various crops. A decrease in gross sales in 1983 was a result of the drop in the number of firms reporting. Gross sales of greenhouse products in Alberta are between $25 to $28 million. During the last few years, some greenhouse operations have been diversified, i.e., produce more than one crop at the same time. The province is also experiencing a growing trend towards "hydroponic" production of tomatoes, lettuce, and cucumbers.

Marketing of Greenhouse Produce

Greenhouse operators surveyed for the 1983-84 crop year used several channels to market their produce. The most important of these are retail facilities owned by greenhouse operators and either attached to the greenhouses or located in cities and towns; other retail and wholesale facilities; the Co-op at Redcliff; and farmers' markets in various centres.

Fifty seven per cent (12) of the greenhouse operators studied for the 1983-84 crop year produced flowers (roses, mums, and poinsettias), bedding plants, foliage plants and selected vegetables. Seven of these operators owned retailing facilities attached to the greenhouse or

TABLE 6

TYPES OF GREENHOUSE CROPS GROWN IN ALBERTA, 1984

	Area	Cukes	Tomatoes	Other Vegtables*	Bedding Plants	Ornamentals Cuts & Pots	Foliage
1.	Ft. McMurray	2	2	1	1	0	0
2.	Grande Prairie	1	2	1	7	2	3
3.	Whitecourt	3	11	1	16	7	7
4.	Edmonton	13	17	4	42	27	24
5.	Bonnyville	1	1	0	4	2	3
6.	Lloydminster	0	0	0	4	3	2
7.	Red Deer	7	10	3	26	10	13
8.	Calgary	4	5	3	18	14	13
9.	Medicine Hat	35	5	1	7	9	2
10.	Lethbridge	3	8	1	12	5	2
	TOTAL	69	61	15	136	79	69

* Other vegetables include: peppers, eggplants, lettuce, cauliflower, cabbage, and chinese vegetables, etc.

located in shopping centres; these facilities handled about 65 to 70 per cent of the produce; the remaining produce was shipped to wholesalers and retailers. A few greenhouse operators from this group marketed 20 to 30 per cent of their produce at the gate and the balance was sold to wholesalers and retailers.

Forty three per cent (9) of the greenhouses studied produced long english cucumbers only. These greenhouse operators were located in Redcliff and Medicine Hat. They marketed all of the produce through the Red Hat Co-op at Redcliff.[2] Producers pay a commission or fee set by the board of directors of the co-op which covers grading, packaging, storage, marketing and administration costs.

In north-central Alberta, greenhouses producing vegetable and bedding plants sold 30 to 40 per cent of the produce at the gate and 60 to 70 per cent through rented stalls and booths in shopping centres and at farmers' markets. Farmers markets have become popular marketing outlets, especially during the bedding plant season throughout Alberta.

2 Red Hat Co-op is a producer organization responsible for the marketing of cucumbers grown in greenhouses in and around Medicine Hat.

SECTION III

GREENHOUSE PRODUCTION COSTS AND RETURNS

Computation of Individual Cost Components

Interest on Investment

Interest is defined as a sum paid or calculated for the use of capital. The sum is usually expressed in terms of a rate or percentage of the capital involved, called the interest rate.

Interest is charged for the use of capital invested. Had the capital not been invested to buy a specific asset, it could have been utilized elsewhere either within or outside the firm, and would have brought some additional return to the firm.

A flat rate of 10 per cent was used for the purposes of this study to determine a fair return to land investment. The building and equipment interest rate was also calculated at 10 per cent. Interest applied to operating capital was the actual interest paid by the study participants.

Depreciation

Depreciation is defined as the loss in value of an asset over time, mainly as a result of obsolescence. In the case of buildings and equipment, it is that portion of the decrease in value resulting from ownership and the passage of time. Obviously, part of the reduced value of the buildings and equipment is the result of usage and is considered a variable cost. The entire depreciation is considered a fixed cost.

In computing depreciation, a 10 per cent allowance or salvage value is taken from the purchase price of the buildings and equipment. The following formula was used in arriving at depreciation for buildings and equipment.

$$\text{Depreciation} = \frac{\text{Purchase Price - Salvage Value}}{\text{No. of Years of Life}}$$

Land value

Land associated with the greenhouse operation was valued at $1,700 per acre irrespective of its location. This value was determined through real estate values for good farmland suitable for a greenhouse operation. It can be argued that the allocation of such a value distorts the cost of land in and around urban areas relative to farmland. However, for uniformity and reasonable cost estimates, it was decided to standardize the land value regardless of its location. Researchers are aware that land values in cities or towns are much higher than $1,700 per acre, but if market values were used for land acquired eight years ago, it would lead to artificially high fixed costs that would greatly inflate overall production costs. Most of the greenhouse operators surveyed have been in business for quite some time with the exception of a few who got started four to five years ago.

Property and business taxes

Taxes on real estate include the payments made on the assessed value of the greenhouse operation less any assessment for the greenhouse operator's residence or operations other than the greenhouse. There is a business tax on greenhouses located in urban municipalities. Exact amounts of property and business taxes were included in the costs.

Labour costs

Hired labour costs included the amount of wages paid, and any benefits received by the hired workers such as contributions to workers' compensation, Canada pension plan and unemployment insurance.

The hours spent by the operator and his/her family in greenhouse production were estimated. An operator's labour was valued at $7.50 per hour and family labour was valued at a rate equal to that paid to hired labour or the actual amount paid to family members.

Production materials and supplies

Production materials and supplies included the purchase of cuttings, seed plants, fertilizers, chemicals, soils, vermiculite, perlite, peat moss, straw, peat pots and plastic. Costs of production materials and supplies were the actual figures provided by the study participants. Heating costs

Almost all the greenhouse operators had reasonably accurate costs for heating the greenhouses with natural gas. Monthly bills were helpful in arriving at the total heating costs.

Utility costs

Utility costs included electricity, telephone and water. Where the utility bill was combined with the greenhouse operator's residence, the operator was asked to apportion the bill to arrive at total utility costs for the greenhouse operation.

Transportation expenses

Expenses for trucks or other vehicles owned by greenhouse operators were apportioned according to their use in the greenhouse operation, and personal and leisure driving. Freight charges paid to commercial or private carriers for hauling greenhouse produce or supplies were included in the transportation expenses.

Maintenance costs

Maintenance costs included repairs to greenhouse structures, boilers, heating equipment, tractors and all other machinery and equipment associated with the greenhouse operation.

Miscellaneous costs

These costs included legal and accounting fees, office supplies, bad debts, donations, membership fees, insurance costs and other costs incurred in a greenhouse operation but not reported under the above costs.

Marketing charges

Marketing charges were the actual amount paid by each greenhouse operator for having produce marketed through the co-op at Redcliff. These charges covered grading, packaging, marketing and administration fees. The charges paid by each grower were included as a cost item in the study.

Greenhouse Investment Costs By Regions

Greenhouse investment costs for the 1983-84 crop year were obtained directly from study participants during the survey. Each operator was asked to value the greenhouse structure based on the current market costs or on replacement value. Study participants were also asked to provide an estimate of the life of the structure in order to calculate interest and depreciation costs.

Investment costs were calculated on land, buildings, machinery, automotives and other miscellaneous equipment. The rate of interest used for determining interest costs for land, buildings and equipment was 10 per cent. Details on average investment and investment costs for the greenhouses in Group I, Group II and the study sample are given in Table 7.

Land investment

The average land area associated with the greenhouses, such as buildings (production area and office) and parking space, was 4.14 acres for Group I participants, 2.30 acres for Group II participants, and 3.09 acres for the study sample. Average land investments per greenhouse in Group I, Group II, and the study sample were $7046, $3909, and $5253, respectively. Land investment cost (land interest) for each greenhouse averaged 2.0¢, 1.0¢ and 2.0¢ per square foot for the Group I, Group II and the study sample, respectively.

Building investment

The average building investment based on the replacement value of the greenhouse facilities studied during the 1983-84 crop year was $364,929 per greenhouse in Group I, $232,378 per greenhouse in Group II, and $289,185 per greenhouse for the study sample. Average investment costs (interest and depreciation) on buildings were $7799, $3454 and $5316 per greenhouse for greenhouses in Group I, Group II and the study sample. The corresponding investment costs per square foot of greenhouse were 108¢, 58¢, and 80¢ respectively.

Equipment investment

The average machinery investment based on the purchase price of the equipment was $31,811 per greenhouse for Group I, $54,276 for Group II, and $44,648 for the study sample. Average investment costs for machinery and equipment were 9¢, 21¢, and 17¢ per square foot for Group I, Group II, and the study sample, respectively. Details on investment and investment costs i.e., interest and depreciation on machinery and equipment are presented in Table 7.

Automotive investment

The average investment in automobiles was $18,875 per greenhouse for participants in Group I, $15,588 for Group II and $19,997 for the study sample. The average investment costs for automotives amounted to 7¢ per square foot each for Group I, Group II and the study sample.

Total investment and investment costs

The average investment per greenhouse for participants in north and north-central Alberta (Group I) was $364,929 compared to $232,278 per greenhouse for the participants in south and south-central Alberta (Group II). The average investment for the study sample was $289,185 per greenhouse. The average investment per square foot of greenhouse area was $10.21, $7.01 and $8.44 for Group I, Group II, and the study sample, respectively.

TABLE 7

AVERAGE INVESTMENT AND INVESTMENT COSTS FOR THE GREENHOUSES SURVEYED, 1983-84

	Group I	Group II	Study Sample
Number Surveyed	9	12	21
Land Area (acres)	4.14	2.30	3.09
Land Value ($)	7045.55	3908.58	5253.00
Land Interest ($)	704.56	390.86	525.30
Land Interest Per Sq Ft ($)	0.02	0.01	0.02
Building Area (Sq Ft)	35739	33155	34263
Building Investment ($)	307197.06	158605.62	222287.69
Building Interest ($)	30719.69	15860.55	22228.76
Building Depreciation ($)	7798.69	3453.87	5315.93
Average Building Interest & Depreciation Per Sq Ft ($)	1.08	0.58	0.80
Equipment Investment ($)	31811.44	54275.83	44648.23
Equipment Interest ($)	3181.14	5427.58	4464.82
Equipment Depreciation ($)	1155.99	1606.92	1413.66
Average Equipment Interest & Depreciation Per Sq Ft ($)	0.12	0.21	0.17
Automotive Investment ($)	18875.11	15587.75	16996.62
Automotive Interest ($)	1887.51	1558.77	1699.66
Automotive Depreciation ($)	1286.28	823.31	1021.72
Average Automotive Interest &Depreciation Per Sq Ft ($)	0.09	0.07	0.08
Average Investment Per Greenhouse ($)	364929.19	232377.75	289185.50
Average Investment Per Sq Ft ($)	10.21	7.01	8.44
Average Investment Costs ($)	46733.84	29121.84	36669.84
Average Investment Costs Per Sq Ft ($)	1.31	0.88	1.07

Group I represents north and north central regions (3, 4, 5 and 6).
Group II represents south and south central regions (1 and 2).

Average investment costs per greenhouse were $46,734 for Group I, $29,122 for Group II, and $36,670 for the study sample. Average investment costs per square foot ranged from 88¢ for Group II participants to $1.31 for greenhouse operators in Group I, and $1.07 per square foot for the study sample. Details on average investment and investment costs are provided in Table 7.

Greenhouse Operating Costs By Regions

Greenhouse operating costs include all costs incurred during the production of greenhouse crops. Some of the most common operating costs are hired labour, material inputs (seed, chemicals, and fertilizers), containers, greenhouse fuel, repairs, maintenance, power, water, property taxes and purchase of supplies. Average operating costs incurred in greenhouses by regions in 1983-84 are provided in Table 8. The highest operating cost item was for hired labour at $56,170 for Group I, $54,892 for Group II, and $55,440 for the study sample. The second highest cost item was growing media, seed and cut tings which amounted to $36,494 for Group I versus $21,429 for Group II; the average for the study sample was $27,885 per greenhouse. Fuel costs for heating the green houses were $35,327 for Group I, 2.14 times those of Group II ($16,487). The average greenhouse fuel cost for the study sample was $24,561.

Greenhouses in north and north-central Alberta (Group I) reported average operating costs of $188,697 per greenhouse versus $178,136 in south and south-central Alberta (Group II). Average operating costs for the study sample amounted to $182,662 (Table 8). Average operating costs per square foot of greenhouse area for Group I, Group II, and the study sample were $5.28, $5.37 and $5.33, respectively.

Production Costs And Returns By Regions

The results presented in Tables 8 and 9 show that the major costs in greenhouse operations were labour (hired, operator and family), followed by material inputs (cuttings, seed, fertilizers, chemicals, containers and labels), greenhouse fuel and utilities, repairs and maintenance. Production costs related to the above were 36 per cent, 17 per cent, 12 per cent and 6 per cent, respectively. Average fuel and utility costs per greenhouse operation in Group I were 13 per cent of total operating costs, compared with 7 per cent for Group II greenhouses.

Production costs for the typical greenhouse surveyed for the 1983-84 crop year amounted to $255,735 or $7.46 per square foot. For greenhouses in north and north-central Alberta, Group I, they were $272,798 compared with $242,938 for greenhouses in south and south-central Alberta, Group II. Correspondingly, average production costs per square foot were $7.63 and $7.33.

The average gross revenue per greenhouse studied in 1983-84 was $248,602 or $7.63 per square foot. For Group I average gross revenue was $261,039 or $7.30 per square foot against $239,274 or $7.22 per square foot for Group II.

The average return over operating costs was positive for both groups of growers and the study sample. It was $72,341l for Group I, $61,138 for Group II and $65,939 the for the study sample.

The average return to management was negative for both groups and the study sample. Negative return to management was 33¢ per square foot for Group I, 11¢ for Group II, and 21¢ for the study sample. Details on costs and returns by regions and the study sample are presented in Table 9.

TABLE 8

AVERAGE GREENHOUSE OPERATING COSTS FOR THE GREENHOUSES SURVEYED, 1983-84

	Group I	Group II	Study Sample
Number Surveyed	9	12	21
GREENHOUSE AREA (Sq Ft)	35739	33155	34263
GROSS REVENUE ($)	261038.87	239274.25	248692
Growing Media, Seed & Cuttings ($)	36493.78	21428.66	27885.14
Fertilizer and Chemicals	4851.22	7104.25	4710.19
Containers, Labels and Tags	11149.55	8823.75	11249.09
Hired Labour	56170.22	54892.00	55439.81
Greenhouse Fuel	35326.78	16486.58	24560.95
Utilities[1]	5825.89	4432.66	5029.76
Insurance and Registration Fees[2]	2570.00	3495.67	3098.95
Repairs and Maintenance[3]	10465.55	19729.58	15759.29
Freight Leasing and Express	4333.55	5930.50	5246.09
Property Taxes	972.11	3576.83	2460.52
Business Taxes	121.33	29.17	68.67
Office Supplies	707.56	1343.17	1070.76
Advertising	2223.78	779.25	1398.33
Accounting and Legal	1409.56	2083.92	1794.90
Marketing Costs[4]	666.67	10196.25	6112.14
Travel, Donations, Memberships	1286.22	2904.67	2211.05
Miscellaneous[5]	3974.56	3195.83	3529.57
Interest on Operating Capital	10149.33	11703.75	11037.57
AVERAGE OPERATING COSTS PER GREENHOUSE($)	188696.87	178136.25	182662.12
AVERAGE OPERATING COSTS PER Sq Ft ($)	5.28	5.37	5.33

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

TABLE 9

COMPARISON OF COSTS AND RETURNS BETWEEN GROUP I, GROUP II, AND THE STUDY SAMPLE, 1983-84

		Group I	Group II	Study Sample
Number Surveyed		9	12	21
A.	**RETURNS**			
	AVERAGE AREA (Sq Ft)	35739	33155	34263
	GROSS REVENUE ($)	261038.87	239274.25	248601.94
	Gross Revenue Per Sq Ft ($)	7.30	7.22	7.26
B.	**OPERATING COSTS**			
	Material Inputs	41345.00	28532.91	32595.33
	Containers/Labels/Tags	11149.55	8823.75	11249.09
	Hired Labour	56170.22	54892.00	55439.81
	Greenhouse Fuel	35326.78	16486.58	24560.95
	Utilities	5825.89	4432.66	5029.76
	Insurance and Registration Fees	2570.00	3495.67	3098.95
	Repairs and Maintenance	10465.55	19729.58	15759.29
	Taxes	1093.44	3606.00	2529.19
	Freight, Leasing and Express	4333.55	5930.50	5246.09
	Advertising	2223.78	779.25	1398.33
	Accounting and Legal	1409.56	2083.92	1794.90
	Marketing Costs	666.67	10196.25	6112.14
	Miscellaneous[1]	5968.33	7443.66	6811.38
	Interest on Operating Capital	10149.33	11703.75	11037.57
	TOTAL OPERATING COSTS	188696.87	178136.25	182662.12
C.	**OTHER COSTS**			
	Land, Bldg., Equip. Interest	36492.89	23237.77	28918.54
	Depreciation	10240.85	5884.05	7751.25
	Operator's Labour	37367.00	35679.50	36402.71
	TOTAL OTHER COSTS	84100.75	64801.30	73072.25
	TOTAL PRODUCTION COSTS	272797.87	242957.56	255734.81
	TOTAL PRODUCTION COSTS PER Sq Ft	7.63	7.33	7.46
D.	**MANAGEMENT FACTORS**			
	RETURN OVER OPERATING COSTS	72341.25	6137.79	65939.19
	RETURN OVER OPERATING COSTS PER SQ. FT.	2.02	1.84	1.92
	RETURN TO MANAGEMENT	(11759.43)	(3663.54)	(7133.20)
	RETURN TO MANAGEMENT PER Sq Ft	(0.33)	(0.11)	(0.21)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

Investment Costs For Greenhouses Producing Cucumbers

The study sample was divided into three main categories according to the type of crop produced. There were nine (9) greenhouse operations mainly producing cucumbers, 10 operations producing bedding plants and other greenhouse crops with bedding plants being the major enterprises, and two operations that produced bedding plants, cut flowers, cucumbers, and mums. Two other greenhouse operations reported a bedding plant operation and tomatoes, but were not included in the sample because of insufficient data.

Cucumber producing greenhouses were further divided into two groups according to the type of growing media used. Seven greenhouses used soil and the other three used either pots or peat moss bags. The main reason for using pots was infestation by nematodes in the soil.

The average land area associated with the group of greenhouses producing cucumbers in soil and pots was 1.04 acres and 0.94 acres, respectively.

The average greenhouse area for cucumbers produced in soil and in pots was 23,757 square feet, and 21,187 square feet, respectively. The average area for both groups combined was 22,986 square feet.

The average building, equipment and automotive investment was $136,056 per greenhouse for cucumbers produced in soil, and $116,167 per greenhouse for cucumbers produced in pots. The average investment for producing both groups of cucumbers was $130,789 per greenhouse or 72¢ per square foot. Details on average investment and investment costs for greenhouses using different growing media to produce cucumbers are given in Table 10.

Operating Costs For Greenhouses Producing Cucumbers

Greenhouses producing cucumbers were divided into two groups according to the type of growing media used, i.e., soil and pots. A comparison of operating costs for both growing media is presented in Table 11 along with the averages for both groups. Marketing costs were the largest cost item for greenhouses using soil, followed by hired labour and greenhouse fuel. Cucumbers grown in pots/peat bags showed considerably higher material input costs when compared with cucumbers grown in soil. Marketing was the leading cost item for cucumbers grown in pots, followed by greenhouse fuel, and repairs and maintenance. Combined operating costs for both groups (soil and pots) showed marketing as the major expenditure, followed by greenhouse fuel, hired labour, and repairs and maintenance.

Average operating costs per greenhouse were $60,988 or $2.71 per square foot for producing cucumbers in soil, $57,666 or $2.89 per square foot for producing cucumbers in pots. The average operating costs for both groups amounted to $59,991 or $2.76 per square foot. Details on individual operating cost items are given in Table 11.

Production Costs and Returns For Greenhouses Producing Cucumbers

The average gross revenue for greenhouse operators using soil to produce cucumbers was $108,567 in 1983-84. Gross revenue per square foot of greenhouse area was $4.57. For operations using pots to produce cucumbers, average gross revenue per greenhouse amounted to $96,874 or $4.57 per square foot. Average gross revenue for both groups was $105,059 or $4.57 per square foot, the same as for cucumbers produced in soil and in pots.

TABLE 10

COMPARISON OF INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES PRODUCING CUCUMBERS, 1983-84

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil and Pots)
Number Surveyed	7	3	10
Land Area (acres)	1.04	0.94	1.01
Land Value ($)	1763.14	1603.67	1715.30
Land Interest ($)	176.31	160.37	171.53
Land Interest Per Sq Ft ($)	0.01	0.01	0.01
Building Area (Sq Ft)	23757	21187	22986
Building Investment ($)	103923.69	94536.62	101107.56
Building Interest ($)	10392.36	9453.66	10110.75
Building Depreciation ($)	2303.74	2335.21	2313.18
Average Building Interest & Depreciation Per Sq Ft ($)	0.53	0.56	0.54
Equipment Investment ($)	25364.43	15570.33	22426.20
Equipment Interest ($)	2536.44	1557.03	2242.62
Equipment Depreciation ($)	779.46	944.44	828.96
Average Equipment Interest & Depreciation Per Sq Ft ($)	0.14	0.12	0.13
Automotive Investment ($)	6005.00	4556.66	5540.50
Automotive Interest ($)	600.50	445.67	554.05
Automotive Depreciation ($)	359.94	281.18	336.31
Average Automotive Interest & Depreciation Per Sq Ft ($)	0.04	0.03	0.04
Average Investment Per Greenhouse ($)	137056.25	116167.31	130789.50
Average Investment Per Sq Ft ($)	5.77	5.48	5.69
Average Investment Costs ($)	17148.75	15177.55	16557.38
Average Investment Costs Per Sq Ft ($)	0.72	0.72	0.72

Average production costs for cucumbers grown in soil were $108,376 per greenhouse, or $4.56 per square foot of the greenhouse area. For cucumbers grown in pots, average production costs per greenhouse in 1983-84 amounted to $105,412 or $4.98 per square foot. Average production costs for both groups when combined were $107,488 per greenhouse or $4.68 per square foot.

The average return over operating costs was relatively higher for greenhouses producing cucumbers in soil compared with greenhouses using pots. The average return for the soil group was $47,580 per greenhouse or $2.00 per square foot compared with $39,208 ($1.85 per square foot) for the pots group. Returns over operating costs for both groups (combined) amounted to $45,068 per greenhouse or $1.96 per square foot. Return to management was positive by a very

TABLE 11

COMPARISON OF OPERATING COSTS FOR GREENHOUSES PRODUCING CUCUMBERS, 1983-84

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil and Pots)
Number Surveyed	7	3	10
GREENHOUSE AREA (Sq Ft)	23757	21187	22986
GROSS REVENUE ($)	108567.37	96874.31	105059.50
Growing Media & Seed/Cuttings	2029.57	6215.66	3285.40
Fertilizer and Chemicals	3016.71	4053.00	3327.60
Hired Labour	11827.43	1003.67	8580.30
Greenhouse Fuel	11176.43	9007.00	10525.60
Utilities[1]	1472.71	1372.67	1442.70
Insurance and Reg. Fees[2]	1384.86	2391.00	1686.70
Repairs and Maintenance[3]	6947.86	8655.66	7460.20
Property Taxes	2539.14	2033.67	2387.50
Business Taxes	30.00	35.00	31.50
Office Supplies	69.00	23.33	55.30
Advertising	55.71		39.00
Accounting and Legal	590.00	1392.33	830.70
Marketing Costs[4]	12904.86	11490.33	12480.50
Travel, Donations, Memberships	290.14	110.00	236.10
Miscellaneous[5]	1875.14	2980.33	2206.70
Interest on Operating Capital	4778.14	6902.33	5415.40
AVERAGE OPERATING COSTS PER GREENHOUSE	60987.66	57665.94	59991.14
AVERAGE OPERATING COSTS PER Sq Ft	2.71	2.89	2.76

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance & fuel expenses for equip., bldgs. & motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

small amount for the soil group (1¢ per square foot). For cucumbers produced in pots, the return to management was negative by 40¢ per square foot. The return to management for both groups (combined) was negative by 11¢ per square foot.

The major costs for greenhouses producing cucumbers related to marketing (commission paid to the co-op for the sale of cucumbers), greenhouse fuel, repairs and maintenance, and interest on operating capital. A breakdown of all investment and operating costs for the two groups of greenhouses and the combined costs of two groups are presented in Table 12.

Greenhouse Investment Costs By Crops Produced

The study sample was divided into three categories according to the types of crops produced. There were nine (9) greenhouse operations mainly producing cucumbers, 10 producing bedding plants and other greenhouse crops with bedding plants being the major enterprise, and two operations that produced bedding plants, cut flowers, cucumbers, and mums.

The average land area associated with the group of greenhouses producing bedding plants was 1.8 acres, with 3.7 acres for the mum producing group. Average greenhouse area for the bedding plants group was 25,106 square feet compared with 55,763 square feet for the mums group.

Average building, equipment and automotive investment amounted to $186,390 per greenhouse operation or $7.42 per square foot for the bedding plants group. Average investment per operation for the mums group was $448,243 ($8.04 per square foot). In 1983-84 average investment costs for buildings, equipment and automotives were estimated at $28,801 or 95¢ per square foot for the bedding plants group, and $55,349 or 99¢ per square foot for the mums group. Details on average investment and investment costs by the types of crops produced are presented in Table 13.

Greenhouse Operating Costs By Crops Produced

Growing media and seed/cuttings were the highest operating cost items for the greenhouses producing bedding plants. These were followed by hired labour and greenhouse fuel. Major operating cost items for greenhouses producing mums were hired labour, followed by growing media, seed/cuttings, greenhouse fuel and interest on operating capital.

Average operating costs for greenhouses producing bedding plants were $105,565 ($4.41 per square foot), and $333,584 ($5.98 per square foot) for the mums group. Details of operating costs for the two crop groups are provided in Table 14.

Greenhouse Production Costs And Returns By Crops Produced

The average gross revenue for greenhouse operations producing mostly bedding plants was $157,220 per operation in 1983-84. Gross revenue per square foot of the greenhouse area was $6.26. Average gross revenue for the three greenhouse operations producing mums was $401,163 or $7.19 per square foot.

Average production costs for the bedding plants group were $154,403 per operation or $6.15 per square foot. The costs for the mums group amounted to $412,041 ($7.39 per square foot).

TABLE 12

COMPARISON OF COSTS AND RETURNS FOR GREENHOUSES PRODUCING CUCUMBERS, 1983-84

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil & Pots)
Number Surveyed	7	3	10
A. RETURNS			
GREENHOUSE AREA (Sq Ft)	23757	21187	22986
GROSS REVENUE ($)	108567.37	96874.31	105059.50
Gross Revenue Per Sq Ft ($)	4.57	4.57	4.57
B. OPERATING COSTS			
Material Inputs	5046.29	10268.66	6613.00
Hired Labour	11827.43	1003.67	8580.30
Greenhouse Fuel	11176.43	9007.00	10525.60
Utilities	1472.71	1372.67	1442.70
Insurance and Registration Fees	1384.86	2391.00	1686.70
Repairs and Maintenance	6947.86	8655.66	7460.20
Taxes	2569.14	2068.67	2419.00
Accounting and Legal	590.00	1392.33	830.70
Advertising	55.71		39.00
Marketing Costs	12904.86	11490.33	12480.50
Miscellaneous[1]	2234.29	3113.67	2498.10
Interest on Operating Capital	4778.14	6902.23	5415.40
TOTAL OPERATING COSTS	60987.66	57665.94	59991.14
C. OTHER COSTS			
Land, Building, Equipment Interest	13705.62	11616.73	13078.95
Depreciation	3443.14	3560.00	3478.45
Operator's Labour	30239.71	32472.66	30939.60
TOTAL OTHER COSTS	47388.45	47750.21	47496.97
TOTAL PRODUCTION COSTS	108376.12	105412.16	107488.00
TOTAL PRODUCTION COSTS PER Sq Ft	4.56	4.98	4.68
D. MANAGEMENT FACTORS			
RETURN OVER OPERATING COSTS	47579.73	39208.37	45068.32
RETURN OVER OPERATING COSTS PER Sq Ft	2.00	1.85	1.96
RETURN TO MANAGEMENT	191.25	(8541.81)	(2428.67)
RETURN TO MANAGEMENT PER Sq Ft	0.01	(0.40)	(0.11)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

TABLE 13

COMPARISON OF INVESTMENT AND INVESTMENT COSTS BY GREENHOUSE CROPS, 1983-84

	Bedding Plants	Mums
Number Surveyed	10	3
Land Area (acres)	1.8	3.7
Land Value ($)	3085.50	6375.00
Land Interest ($)	308.55	637.50
Land Interest Per Sq Ft ($)	0.01	0.01
Building Area (Sq Ft)	25106	55763
Building Investment ($)	135297.56	352826.31
Building Interest ($)	13529.75	35282.62
Building Depreciation ($)	3441.10	7956.86
Average Building Interest & Depreciation Per Sq Ft ($)	0.68	0.78
Equipment Investment ($)	34111.40	76791.62
Equipment Interest ($)	3411.14	7679.16
Equipment Depreciation ($)	752.41	1961.69
Average Equipment Interest & Depreciation Per Sq Ft ($)	0.17	0.17
Automotive Investment ($)	13895.30	12250.00
Automotive Interest ($)	1389.53	1225.00
Automotive Depreciation ($)	968.76	606.37
Average Automotive Interest & Depreciation Per Sq Ft ($)	0.09	0.03
Average Investment Per Greenhouse ($)	186389.69	448243.00
Average Investment Per Sq Ft ($)	7.42	8.04
Average Investment Costs ($)	23801.21	55349.16
Average Investment Costs Per Sq Ft ($)	0.95	0.99

The average return over operating costs per square foot was considerably higher for the bedding plants group as compared with the group producing mums. Returns over operating costs for bedding plants were $51,654 ($2.06 per square foot) per greenhouse operation versus $67,579 ($1.21 per square foot) for mums. Average return to management was positive at 11¢ per square foot for bedding plant operations, and negative by 20¢ per square foot for greenhouses producing mums.

The most significant cost items for the above greenhouse operations were hired labour, material inputs, operator and family labour, greenhouse fuel, repairs and maintenance. A breakdown of all operating and investment costs for the greenhouses classified according to crops produced is presented in Table 15.

TABLE 14

COMPARISON OF OPERATING COSTS BY GREENHOUSE CROPS, 1983-84

	Bedding Plants	Mums
Number Surveyed	10	3
GREENHOUSE AREA (Sq Ft)	25106	55763
GROSS REVENUE ($)	157220.00	401162.62
Growing Media & Seed/Cuttings	23585.90	54753.33
Fertilizer and Chemicals	3129.30	12634.00
Containers, Labels and Tags	7600.80	29248.33
Hired Labour	22592.80	110234.31
Greenhouse Fuel	18593.10	34457.33
Utilities[1]	3695.50	7381.66
Insurance and Reg. Fees[2]	1818.30	5669.00
Repairs and Maintenance[3]	6917.80	16263.00
Freight Leasing and Express	2113.90	18229.66
Property Taxes	1178.00	1394.67
Business Taxes	100.00	
Office Supplies	663.80	2065.00
Advertising	1810.50	1158.67
Accounting and Legal	1245.70	3828.67
Marketing Costs[4]	342.00	
Travel, Donations, Memberships	1105.10	4648.33
Miscellaneous[5]	3638.50	4215.33
Interest on Operating Capital	5433.90	28402.66
AVERAGE OPERATING COSTS PER GREENHOUSE	105565.50	333583.94
AVERAGE OPERATING COSTS PER Sq Ft	4.41	5.98

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance & fuel expenses for equip., bldgs. & motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

TABLE 15

COMPARISON OF COSTS AND RETURNS BY GREENHOUSE CROPS, 1983-84

		Bedding Plants	Mums
Number Surveyed		10	3
A.	**RETURNS**		
	GREENHOUSE AREA (Sq Ft)	25106	55763
	GROSS REVENUE ($)	157220.00	401162.62
	Gross Revenue Per Sq Ft ($)	6.26	7.19
B.	**OPERATING COSTS**		
	Material Inputs ($)	26715.20	66387.31
	Containers, Labels and Tags	7600.80	29248.33
	Hired Labour	22592.80	110234.31
	Greenhouse Fuel	18593.10	34457.33
	Utilities	3695.50	7381.66
	Insurance and Registration Fees	1818.30	5669.00
	Repairs and Maintenance	6917.80	16263.00
	Taxes	1278.70	1394.67
	Freight, Leasing and Express	2113.90	18229.60
	Accounting and Legal	1245.70	3828.67
	Advertising	1810.50	1158.67
	Marketing Costs	1810.50	1158.67
	Miscellaneous[1]	5407.40	10928.66
	Interest on Operating Capital	5433.90	28402.66
	TOTAL OPERATING COSTS	105565.50	333583.94
C.	**OTHER COSTS**		
	Land, Building, Equipment Interest ($)	18638.97	44824.27
	Depreciation	5162.18	10524.63
	Operator's Labour	25036.20	23108.66
	TOTAL OTHER COSTS ($)	48837.34	78457.56
	TOTAL PRODUCTION COSTS ($)	154402.69	412041.31
	TOTAL PRODUCTION COSTS PER Sq Ft ($)	6.15	7.39
D.	**MANAGEMENT FACTORS**		
	RETURN OVER OPERATING COSTS ($)	51654.44	67578.69
	RETURN OVER OPERATING COSTS PER Sq Ft ($)	2.06	1.21
	RETURN TO MANAGEMENT ($)	2817.08	(10878.87)
	RETURN TO MANAGEMENT PER Sq Ft ($)	0.11	(0.20)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

SECTION IV

GREENHOUSE PRODUCTION COSTS AND RETURNS FOR COMBINATION CROPS AND BY SIZE OF OPERATION

Investment Costs For Greenhouses Producing Combination Crops

The study sample of 21 greenhouse operations was divided into two main groups. One group included crops like bedding plants, foliage plants, mums, poinsettias and roses, and the other group included cucumbers and tomatoes. Two operations reported producing more than one crop in the respective crop groups, thus increasing the total number of greenhouses in Tables 16, 17 and 18 to 25.

The average land area associated with the group of greenhouses producing combination crops, i.e., bedding plants and flowers was about 2.71 acres. Land area for the vegetable producing group was 0.94 acres. The average greenhouse area for the bedding plants and flowers group was 35,150 square feet compared to 21,169 square feet for the vegetables group.

Investment for buildings, equipment and automotives was considerably higher for the bedding plants and flowers group as compared to the vegetables group. Building investment costs were 68¢ per square foot for the former group versus 54¢ for the latter group. Equipment and automotive investment costs for the bedding plants and flowers group were 28¢ per square foot versus 17¢ per square foot for the vegetables group.

The average investment per greenhouse was $270,434 for the greenhouses producing combination crops and $119,748 for the vegetables group. The average investment cost per square foot of greenhouse area for land, buildings, equipment and automotives was 97¢ for the bedding plants and flowers, and 55¢ for the vegetable group. Details of investment and investment costs for greenhouses producing combination crops are presented in Table 16.

Operating Costs For Greenhouses Producing Combination Crops

As mentioned above, all greenhouses surveyed were divided into two groups according to the types of crops produced in order to study the distribution of operating costs in 1983-84. Hired labour was the largest expense item for the group producing bedding plants and flowers. Growing media, seed and cuttings were the second largest expense item for these greenhouse operations followed by greenhouse fuel and repairs. The marketing cost was the largest expense for the greenhouses in the vegetable group, followed by greenhouse fuel and hired labour. Operating costs incurred in 1983-84 for the two groups of crops are provided in Table 17.

The average operating costs per greenhouse operation were $193,787 for the group of greenhouses producing bedding plants and flowers and $54,788 for the vegetables group. The average operating costs per square foot of greenhouse area were $5.51 and $2.74 for the bedding plants and flowers, and the vegetable group, respectively.

Production Costs And Returns For Greenhouses Producing Combination Crops

Average gross revenue for greenhouse operations producing mostly bedding plants and flowers was $257,639 in 1983-84. Gross revenue per square foot of the greenhouse area was

TABLE 16

AVERAGE INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES PRODUCING COMBINATION CROPS, 1983-84

	Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
Number Surveyed[1]	14	11
Land Area (acres)	2.71	0.94
Land Value ($)	4602.14	1598.00
Land Interest ($)	460.21	159.80
Land Interest Per Sq Ft ($)	0.01	0.01
Building Area (Sq Ft)	35150	21169
Building Investment ($)	191651.69	92577.31
Building Interest ($)	19165.16	9257.73
Building Depreciation ($)	4610.84	2120.43
Average Building Interest & Depreciation Per Sq Ft ($)	0.68	0.54
Equipment Investment ($)	54653.07	20448.09
Equipment Interest ($)	5465.30	2044.81
Equipment Depreciation ($)	1376.96	759.61
Average Equipment Interest & Depreciation Per Sq Ft ($)	0.19	0.13
Automotive Investment ($)	19527.21	5124.54
Automotive Interest ($)	1952.72	512.45
Automotive Depreciation ($)	1167.27	311.94
Average Automotive Interest & Depreciation Per Sq Ft ($)	0.09	0.04
Average Investment Per Greenhouse ($)	270434.06	119747.87
Average Investment Per Sq Ft ($)	7.69	5.66
Average Investment Costs ($)	34198.37	15166.75
Average Investment Costs Per Sq Ft ($)	0.97	0.72

[1] Two greenhouses reported more than one crop.

$7.33. For the operations producing vegetables (mainly cucumbers), average gross revenue per greenhouse was $96,190 or $4.54 per square foot.

Average production costs for the bedding plants and flowers group were $254,118 per operation or $7.23 per square foot. For the vegetables group, average production costs amounted to $98,386 per operation or $4.65 per square foot.

Average return over operating costs (dollars per square foot) was somewhat lower for the crop combination group, i.e., bedding plants and flowers than for the vegetables group. For the

TABLE 17

COMPARISON OF OPERATING COSTS FOR GREENHOUSES PRODUCING COMBINATION CROPS, 1983-84

	Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
Number Surveyed	14	11
GREENHOUSE AREA (Sq Ft)	35150	21169
GROSS REVENUE ($)	257639.19	96190.44
Growing Media & Seed/Cuttings	31758.00	2987.64
Fertilizer and Chemicals	6276.36	3034.18
Containers, Labels and Tags	13564.50	
Hired Labour	62086.86	7813.91
Greenhouse Fuel	22758.14	9607.82
Utilities[1]	5615.14	1325.18
Insurance and Reg. Fees[2]	3030.07	1545.64
Repairs and Maintenance[3]	17015.79	6850.18
Freight Leasing and Express	7106.79	
Property Taxes	1914.71	2170.45
Business Taxes	71.93	28.64
Office Supplies	1425.64	51.00
Advertising	1817.93	38.64
Accounting and Legal	1928.50	758.82
Marketing Costs[4]	244.29	11425.45
Travel, Donations, Memberships	2371.86	214.64
Miscellaneous[5]	4136.36	2012.91
Interest on Operating Capital	10665.21	4923.09
AVERAGE OPERATING COSTS PER GREENHOUSE OPERATION	193787.31	54788.13
AVERAGE OPERATING COSTS PER Sq Ft	5.51	2.74

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance fuel expenses for equip., bldgs. & motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

bedding plants and flowers group it was $63,851 ($1.82 per square foot) per operation and $41,402 ($1.96 per square foot) for the vegetable group. Return to management was positive by $3,520 for the bedding plants and flowers group, and negative by $2,196 for the vegetables group. Details on operating costs, investment costs, total production costs, and returns over operating costs, and returns to management for both groups are presented in Table 18.

Investment Costs By Size Of Greenhouse Operation

The study sample was further divided into three groups according to the size of the operation. Seven (33%) operations were placed in a group for which greenhouse area was up to 19,999 square feet; 10 (48%) in the 20,000 to 44,999 square feet range; and the remaining four (19%) were placed in the 45,000 square feet and over category. The average greenhouse area for the smallest class of operation was 16,096 square feet; for the intermediate size of operation 23,947 square feet; and 91,843 square feet for the largest operations.

The average land area associated with a greenhouse operation was 0.64 acres for the up to 19,999 square feet group, 2.39 acres for greenhouse operations in the 20,000 to 44,999 square foot category and 9.13 acres for those with an area of more than 45,000 square feet.

The average building and equipment investment costs were 81¢ per square foot for the smallest class of operations (up to 19,999 square feet group), 67¢ and $1.22 per square foot for the intermediate and the largest class of greenhouse operations, respectively. Average investment costs per operation were $14,131 or 88¢ per square foot for those in the up to 19,999 square feet group; $18,791 or 78¢ per square foot for the group in the 20,000 to 44,999 square foot range; and $120,809 or $1.32 per square foot for operations in the more than 45,000 square foot class. Details on average investment and investment costs by size of operation are presented in Table 19.

Operating Costs By Size Of Greenhouse Operation

The average operating costs presented in Table 20 indicate that growing media and seed/cuttings were the largest expense item for the operation in the up to 19,999 square foot category. These were followed by greenhouse fuel, interest on operating capital, marketing costs, and repairs and maintenance. Detailed operating costs for the intermediate and large operations are presented in Table 20. In 1983-84, average total operating costs amounted to $58,071 ($3.61 per square foot) for the smallest operations. These costs increased to $88,972 ($3.72 per square foot) for the intermediate sized operations and $634,925 ($6.91 per square foot) for the largest greenhouse operations.

Production Costs And Returns By Size Of Greenhouse Operation

The average total production costs per operation were $100,122 for greenhouses in the up to 19,999 square foot group, $145,297 for those in 20,000 to 44,999 square foot class, and $804,153 for the largest operations. However, average production costs per square foot were lowest for the intermediate sized operations at $6.07 compared with $6.22 for the smallest operations and $8.76 per square foot for the largest ones. The average gross revenue for small operations was $89,773 or $5.58 per square foot of area. For operation in 20,000 to 44,999 square foot class, average gross revenue was $134,499 or $5.62. For the third category of operation, i.e., 45,000 square feet and over, average gross revenue was $811,811 per operation or $8.84 per square foot (Table 21).

TABLE 18

COMPARISON OF COSTS AND RETURNS BY GREENHOUSES PRODUCING COMBINATION CROPS, 1983-84

		Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
	Number Surveyed	14	11
A.	**RETURNS**		
	GREENHOUSE AREA (Sq Ft)	35150	21169
	GROSS REVENUE ($)	257639.19	96190.44
	Gross Revenue Per Sq Ft ($)	7.33	4.54
B.	**OPERATING COSTS**		
	Material Inputs ($)	38034.36	6021.82
	Containers, Labels and Tags	13564.50	
	Hired Labour	62086.86	7813.91
	Greenhouse Fuel	22758.14	9607.82
	Utilities	5615.14	1325.18
	Insurance and Registration Fees	3030.07	1545.64
	Repairs and Maintenance	17015.79	6850.18
	Taxes	1968.64	2199.09
	Freight, Leasing and Express	7106.79	-
	Accounting and Legal	1928.50	758.82
	Advertising	1817.93	38.14
	Marketing Costs	244.29	11425.45
	Miscellaneous[1]	7933.86	2278.55
	Interest on Operating Capital	10665.21	4923.09
	TOTAL OPERATING COSTS	193787.31	54788.13
C.	**OTHER COSTS**		
	Land, Bldg., Equip. Interest ($)	27043.39	11974.79
	Depreciation	7154.86	3191.94
	Operator's Labour	26132.57	28431.45
	TOTAL OTHER COSTS ($)	60330.83	43598.16
	TOTAL PRODUCTION COSTS ($)	254118.50	98386.12
	TOTAL PRODUCTION COSTS PER Sq Ft ($)	7.23	4.65
D.	**MANAGEMENT FACTORS**		
	RETURN OVER OPERATING COSTS ($)	63851.18	41402.29
	RETURN OVER OPERATING COSTS PER Sq Ft ($)	1.82	1.96
	RETURN TO MANAGEMENT ($)	3520.32	(2195.89)
	RETURN TO MANAGEMENT PER Sq Ft ($)	0.10	(0.11)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

TABLE 19

COMPARISON OF INVESTMENT AND INVESTMENT COSTS BY SIZE OF OPERATION, 1983-84

	Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
Number Surveyed	7	10	4	21
Land Area (acres)	0.64	2.39	9.13	3.09
Land Value ($)	1092.86	4061.30	15512.50	5253.00
Land Interest ($)	109.29	406.13	1551.25	525.30
Land Interest Per Sq Ft ($)	0.01	0.02	0.02	0.02
Building Area (Sq Ft)	16096	23947	91843	34263
Building Investment ($)	77185.69	103981.00	771983.00	222287.69
Building Interest ($)	7718 57	10398.09	77198.25	22228.76
Building Depreciation ($)	2072.25	2637.40	17688.75	5315.93
Average Building Interest & Depreciation Per Sq Ft ($)	0.61	0.54	1.03	0.80
Equipment Investment ($)	23725.57	21698.90	138636.25	44648.23
Equipment Interest ($)	2372.56	2169.89	13863.62	4464.82
Equipment Depreciation ($)	898.40	833.78	3765.10	1413.66
Average Equipment Interest & Depreciation Per Sq Ft ($)	0.20	0.13	0.19	0.17
Automotive Investment ($)	5886.43	13532.60	45099.50	16996.62
Automotive Interest ($)	588.64	1353.26	4509.95	1699.66
Automotive Depreciation ($)	371.16	992.84	2232.42	1021.72
Average Automotive Interest & Depreciation Per Sq Ft ($)	0.06	0.10	0.07	0.08
Average Investment Per Greenhouse ($)	107890.56	143273.69	971231.25	289185.50
Average Investment Per Sq Ft ($)	6.70	5.98	10.57	8.44
Average Investment Costs ($)	14130.85	18791.37	120809.25	36669.84
Average Investment Costs Per Sq Ft ($)	0.88	0.78	1.32	1.07

Greenhouse operations of up to 19,999 square feet showed the highest return over operating costs, $1.97 per square foot, followed by the largest operations, i.e., 45,000 square feet and over at $1.93 per square foot, with $1.90 per square foot for operations in the 20,000 to 44,999 square feet category. The average return over operating costs for the study sample was $1.92 per square foot.

Average return to management for the study sample was negative at 21¢ per square foot or $7,133 per operation. Only greenhouse operations in the 45,000 square foot and over class showed a positive return to management of $7,658 or 8¢ per square foot. The other two groups

TABLE 20

COMPARISON OF OPERATING COSTS BY SIZE OF OPERATION, 1983-84

	Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
Number Surveyed	7	10	4	21
GREENHOUSE AREA (Sq Ft)	16096	23947	91843	34263
GROSS REVENUE ($)	89773.00	134498.69	811810.75	248601.94
Growing Media & Seed/Cuttings ($)	15496.71	14740.90	82425.50	27885.14
Fertilizer and Chemicals	830.87	2256.10	17634.25	4710.19
Containers, Labels and Tags	1412.71	5665.70	42421.25	11249.09
Hired Labour	2438.57	14286.60	251075.00	55439.81
Greenhouse Fuel	11783.71	14481.00	72121.00	24560.95
Utilities[1]	2352.29	3353.50	13906.00	5029.76
Insurance and Reg. Fees[2]	1089.29	2323.70	8554.00	3098.95
Repairs and Maintenance[3]	4268.29	8742.40	53410.75	15759.29
Freight Leasing and Express	1463.14	876.00	22791.50	5246.09
Property Taxes	1326.43	2065.20	5433.50	2460.52
Business Taxes	20.00	126.70	35.00	68.67
Office Supplies	163.86	699.50	3568.00	1070.76
Advertising	319.57	1932.10	1939.25	1398.33
Accounting and Legal	717.86	1514.30	4381.25	1794.90
Marketing Costs[4]	5633.14	5892.30	7500.00	6112.14
Travel, Donations, Memberships	518.57	795.20	8712.50	2211.05
Miscellaneous[5]	2280.29	3582.10	5594.50	3529.57
Interest on Operating Capital	5956.14	5633.40	33440.50	11037.57
AVERAGE OPERATING COSTS PER GREENHOUSE ($)	58071.09	88971.62	634925.00	182662.12
AVERAGE OPERATING COSTS PER Sq Ft ($)	3.61	3.72	6.91	5.33

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

TABLE 21

COMPARISON OF COSTS AND RETURNS BY SIZE OF OPERATION, 1983-84

		Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
	Number Surveyed	7	10	4	21
A.	**RETURNS**				
	Average Area (Sq Ft)	16096	23947	91843	34263
	GROSS REVENUE ($)	89773.00	134498.69	811810.75	248601.94
	GROSS REVENUE PER Sq Ft ($)	5.58	5.62	8.84	7.26
B.	**OPERATING COSTS**				
	Material Inputs ($)	16327.29	16997.00	100059.75	32595.33
	Containers, Labels and Tags	1412.71	5665.70	42421.25	11249.09
	Hired Labour	2438.57	14286.60	251075.00	55439.81
	Greenhouse Fuel	11783.71	14481.00	72121.00	24560.95
	Utilities	2352.29	3353.50	13906.00	5029.76
	Insurance and Registration Fees	1089.29	2323.70	8554.00	3098.95
	Repairs and Maintenance	4268.29	8742.40	53410.00	15759.29
	Taxes	1346.43	2191.90	5468.55	2529.19
	Freight, Leasing and Express	1463.14	876.00	22791.50	5246.09
	Accounting and Legal	717.86	1514.30	4381.25	1794.90
	Advertising	319.57	1937.00	1939.25	1398.33
	Marketing Costs	5633.14	5892.30	7500.00	6112.14
	Miscellaneous[1]	2962.71	5076.80	17883.00	6811.38
	Interest on Operating Capital	5956.14	5633.40	33440.50	11037.57
	TOTAL OPERATING COSTS	58071.09	88971.62	634925.00	182662.12
C.	**OTHER COSTS**				
	Land, Building, Equip. Interest ($)	10789.05	14327.37	97123.06	28918.54
	Depreciation	3341.74	4463.97	23686.16	7751.25
	Operator's Labour	27920.00	37534.20	48418.75	36402.71
	TOTAL OTHER COSTS ($)	42050.77	56325.52	169227.94	73072.25
	TOTAL PRODUCTION COSTS ($)	100121.87	145297.06	804153.00	255734.81
	TOTAL PRODUCTION COSTS PER Sq Ft ($)	6.22	6.07	8.76	7.46
D.	**MANAGEMENT FACTORS**				
	RETURN OVER OPERATING COSTS[1] ($)	31701.86	45527.05	176885.31	65939.19
	RETURN OVER OPERATING COSTS PER Sq Ft ($)	1.97	1.90	1.93	1.92
	RETURN TO MANAGEMENT ($)	(10348.91)	(10798.50)	7657.53	(7133.20)
	RETURN TO MANAGEMENT PER Sq Ft ($)	(0.64)	(0.45)	0.08	(0.21)

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

of operations, i.e., the smallest and the intermediate, showed negative returns to management of 64¢ and 45¢ per square foot, respectively. Details for the three groups of greenhouses and the study sample regarding average gross revenue, operating costs, other costs and return over operating costs as well as return to management as determined by the size of operation are given in Table 21.

Comparison Of Costs And Returns Between The Study Sample And Your Greenhouse Operation

The information presented in Table 22 will be of particular significance to the study participants as it provides an opportunity for each greenhouse operator to compare his/her results with those of the study sample. Table 22 lists average costs and returns data for the study sample only, and a column has been left blank for the personal use of the study participant. Study participants each received a personalized report on their 1983-84 greenhouse operation along with the results of the study sample divided into regions, by type of crop produced, and by size of greenhouse operation.

TABLE 22

COMPARISON OF COSTS AND RETURNS BETWEEN THE STUDY SAMPLE AND YOUR GREENHOUSE OPERATION

		Study Sample	Your Greenhouse
	Number Surveyed	21	-
A.	**RETURNS**		
	AVERAGE AREA (Sq Ft)	34263	-
	GROSS REVENUE ($)	248601.94	-
	Gross Revenue Per Sq Ft ($)	7.26	-
B.	**OPERATING COSTS**		
	Material Inputs	32595.33	-
	Containers, Labels and Tags	11249.09	
	Hired Labour	55439.81	-
	Greenhouse Fuel	24560.95	-
	Utilities	5029.76	-
	Insurance and Registration Fees	3098.95	-
	Repairs and Maintenance	15759.29	-
	Taxes	2529.19	-
	Freight, Leasing and Express	5246.09	-
	Advertising	1398.33	-
	Accounting and Legal	1794.90	-
	Marketing Costs	6112.14	-
	Miscellaneous[1]	6811.38	-
	Interest on Operating Capital	11037.57	-
	TOTAL OPERATING COSTS	182662.12	-
C.	**OTHER COSTS**		
	Land, Building, Equipment Interest	28918.54	-
	Depreciation	7751.25	
	Operator's Labour	36402.71	-
	TOTAL OTHER COSTS	73072.25	-
	TOTAL PRODUCTION COSTS	255734.81	-
	TOTAL PRODUCTION COSTS PER Sq Ft	7.46	-
D.	**MANAGEMENT FACTORS**		
	RETURN OVER OPERATING COSTS	65939.19	-
	RETURN OVER OPERATING COSTS PER Sq Ft	1.92	-
	RETURN TO MANAGEMENT	(7133.20)	-
	RETURN TO MANAGEMENT PER Sq Ft	(0.21)	-

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

SECTION V

COMPARISON BETWEEN 1982-83 AND 1983-84 GREENHOUSE STUDY RESULTS

This section provides a brief comparison of average costs and returns for the two study years for general information purposes. It is difficult to compare the results of the two study years because of the change in the sample size and crop mix. However, an attempt has been made to show how the major input costs and returns have changed over the last two years. Results from the 1983-84 study year have also been compared with the results from the 1978-79 and 1979-80 study years to show the changes in costs and returns over the last several years.

During the 1982-83 survey of the greenhouse industry, 25 greenhouse owners provided detailed information on their operations. In the 1983-84 survey only 21 greenhouse operators were visited to obtain the required information. Some of the growers who participated in the 1982-83 survey were unable to participate in the 1983-84 survey. Therefore new participants were selected for replacement which resulted in changes in the sample size and cropping mix.

The average greenhouse area for Group I and Group II participants in 1982-83 was 40,197 square feet and 31,793 square feet, respectively. The average area for the study sample in 1982-83 was 34,818 square feet. Greenhouse area for the 21 participants in 1983-84 averaged 34,263 square feet. The average greenhouse area for Group I and Group II participants during 1983-84 was 35,739 square feet and 33,155 square feet, respectively. Average gross revenue during the 1983-84 crop year was relatively higher than for the previous crop year. Average production costs and returns were also higher in the 1983-84 crop year.

The average greenhouse area in the two study samples was more or less the same for both crop years (1982-83 and 1983-84), although there was a considerable range in size in both groups. Table 23 presents comparison between the two study years for gross revenue and production costs.

In 1983-84, average gross revenue for Group I, Group II and the study sample showed a considerable increase over the 1982-83 crop year. For example, gross revenue for the study sample in 1983-84 amounted to $7.26 per square foot versus $6.31 per square foot during the 1982-83 crop year. Similarly, total production costs increased significantly in the 1983-84 crop year compared with the 1982-83 crop year, i.e., from $6.62 to $7.46 per square foot

Details regarding size of the sample, gross revenue, average operating costs, other costs, total production costs, return over operating costs and return to management for the 1982-83 and 1983-84 crop years are presented in Table 23.

Figures 3 and 4 show the distribution of various cost components for the crop years 1978-79, 1979-80, 1982-83 and 1983-84. Material inputs (seed, cuttings, growing media, fertilizer, chemicals, containers, labels and tags) decreased from 20 per cent in 1982-83 to 17 per cent in 1983-84. Labour costs (hired and operator) showed an increase of 2 per cent during the 1983-84 crop year from 1982-83.

Greenhouse fuel (heating) costs which were about 10 per cent of the overall production costs in 1982-83 remained constant during the 1983-84 crop year. The Primary Producers' Energy Rebate Program did offset part of the greenhouse heating costs and most of the greenhouse

TABLE 23

COMPARISON BETWEEN 1982-83 AND 1983-84 GREENHOUSE STUDY RESULTS 1982-83 1983-84

	Group I	Group II	Study Sample	Group I	Group II	Study Sample
Number Surveyed	9	16	25	9	12	21
A. RETURNS						
Average Area (Sq Ft)	40197	31793	34818	35739	33155	34263
Gross Revenue ($)	288932.62	180617.12	219610.69	261038.87	239274.25	248602
Gross Revenue Per Sq Ft ($)	7.19	5.68	6.31	7.30	7.22	7.26
B. OPERATING COSTS						
Material Inputs	47081.89	25855.63	33497.08	41345.00	28532.91	34083.81
Containers, Labels & Tags	13647.89	11201.81	12082.40	11149.55	8823.75	9820.52
Hired Labour	52771.22	37916.12	43263.96	56170.22	54892.00	55439.81
Greenhouse Fuel	35913.55	16051.44	23201.80	35326.78	16486.58	24560.91
Utilities	5707.22	3959.87	4588.92	5825.89	4432.66	5029.76
Insurance and Registration Fees	3597.11	2530.94	2914.76	2570.00	3495.67	3098.95
Repairs and Maintenance	12011.78	13815.62	13166.24	10465.55	19729.58	15759.29
Taxes	1259.33	2251.94	1894.60	1093.44	3606.00	2529.19
Freight, Leasing and Express	4556.89	5916.81	5427.24	4333.55	5930.50	5246.09
Advertising	3680.56	639.56	1734.32	2223.78	779.25	1398.33
Accounting and Legal	2236.67	1476.31	1750.04	1409.56	2083.92	1794.90
Marketing Costs	1100.00	8656.06	5935.88	666.67	10196.25	6112.14
Miscellaneous[1]	3935.10	4277.75	4154.40	5968.33	7443.66	6811.38
Interest on Operating Capital	2570.89	12685.44	9044.20	10149.33	11703.75	11037.57
TOTAL OPERATING COSTS	190069.84	147235.13	162655.47	188,696.87	178136.25	182662.12
C. OTHER COSTS						
Land, Building, Equipment Interest	38222.14	19710.25	26374.53	36492.89	23237.77	28918.54
Depreciation	10179.66	5124.68	6944.47	10240.85	5884.05	7751.25
Operator's Labour	42943.11	29740.00	34493.12	37367.00	35679.50	36402.71
TOTAL OTHER COSTS	91344.91	54574.93	67812.11	84100.75	64801.30	73072.25
TOTAL PRODUCTION COSTS	281414.75	201810.06	230467.58	272797.87	242937.56	255734.81
TOTAL PRODUCTION COSTS PER Sq Ft	7.00	6.35	6.62	7.63	7.33	7.46
D. MANAGEMENT FACTORS						
RETURN OVER OPERATING COSTS[2]	98862.52	33381.91	56955.16	72341.25	61137.79	65939.19
RETURN OVER OPERATING COSTS PER Sq Ft	2.46	1.05	1.64	2.02	1.84	1.92
RETURN TO MANAGEMENT	5717.61	(21192.94)	(10856.95)	(11759.43)	(3663.54)	(7133.20)
RETURN TO MANAGEMENT PER Sq Ft	0.19	(0.67)	(0.31)	(0.33)	(0.11)	(0.21)

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

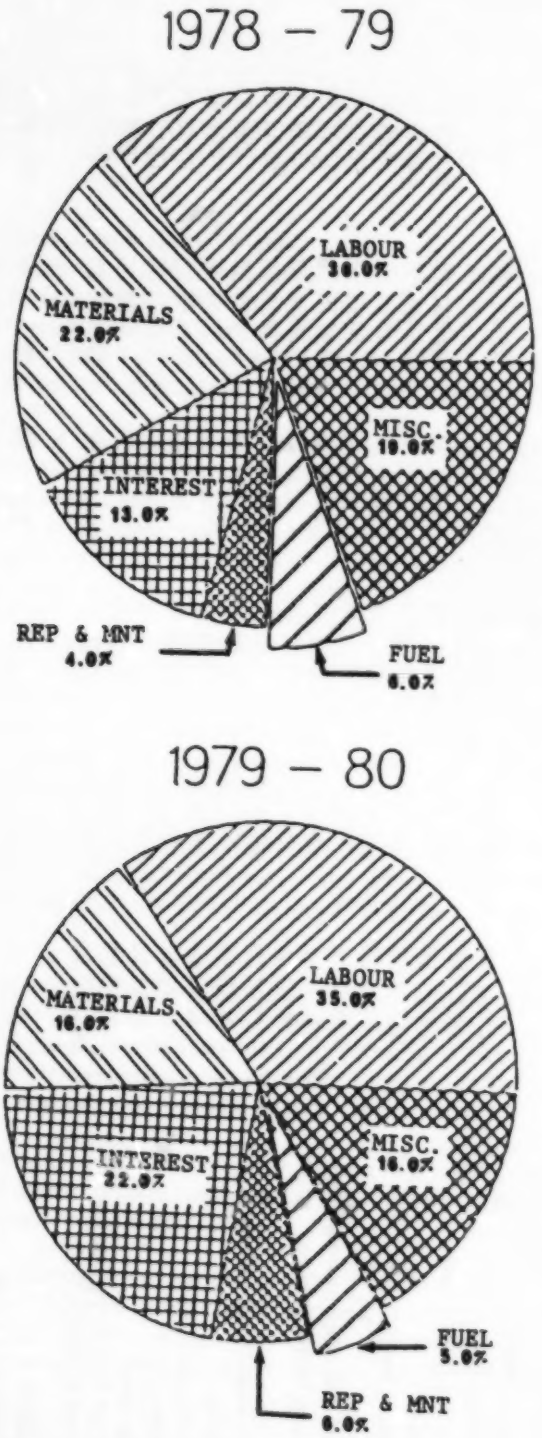

FIGURE 3: COMPARISON OF GREENHOUSE PRODUCTION COSTS, 1978-79 AND 1979-80 CROP YEARS

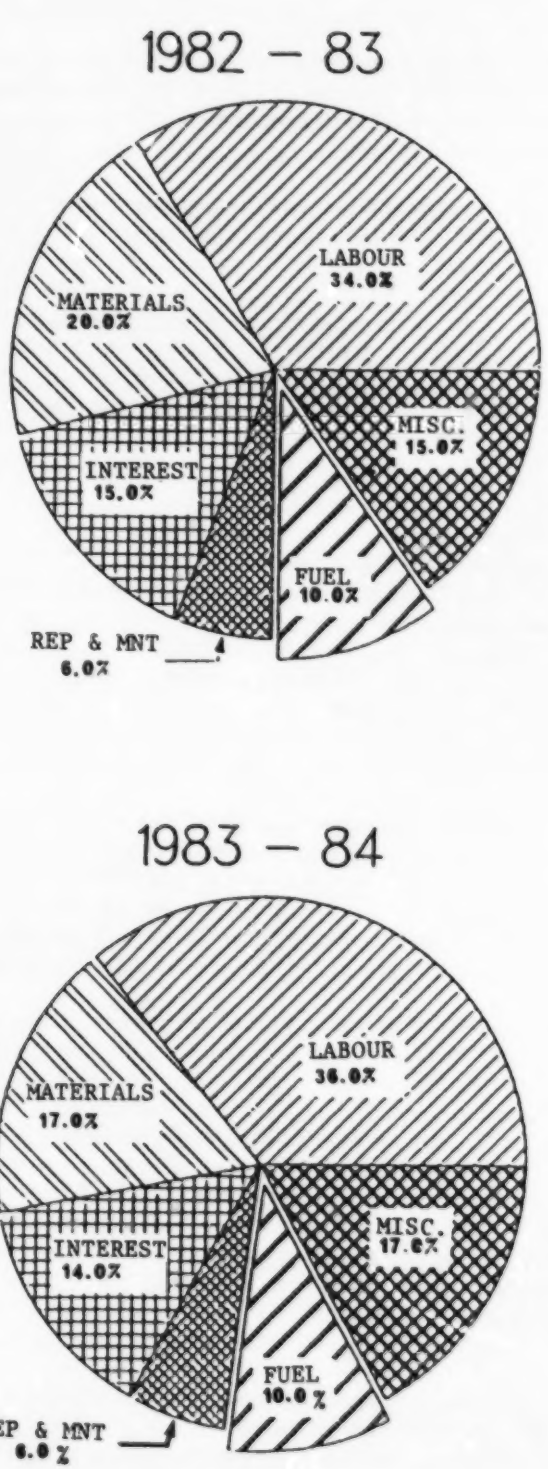

FIGURE 4: COMPARISON OF GREENHOUSE PRODUCTION COSTS, 1982-83 AND 1983-84 CROP YEARS

operators were very pleased with the program. Greenhouse operators were concerned that if this program was withdrawn (it was due to expire on December 31, 1984 but has been extended to December 31, 1985), they would not be able to keep their facilities in production during the winter months because of high heating costs.

Interest costs (operating & investment) showed a marginal increase from 15 per cent in 1982-83 to about 16 per cent in 1983-84. These costs were considerably higher during the 1979-80 crop year, amounting to about 22 per cent.

Miscellaneous costs (small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising), utilities (power and water), insurance and registration fees, taxes, freight leasing express, advertising, accounting and legal, and marketing costs for 1983-84 decreased to about 12 per cent from 15 per cent in 1982-83.

SECTION VI

SUMMARY

Summary of Costs and Returns

This section provides summaries of the 1983-84 costs and returns information for the study sample by region, by types of crops grown in the greenhouses, and by the size of greenhouse operations. Twenty-three greenhouse operators were surveyed to obtain the required data. Analysis in the report is based on 21 greenhouse operations as two greenhouses were not included because of inadequate information.

When the study sample was divided by region, there were nine (9) greenhouses (43%) in the north and north-central regions (Group I), and 12 greenhouses (57%) in the south and south-central regions (Group II). Distribution based on the types of crops produced showed 14 operations producing mainly bedding plants, flowers (poinsettias, mums and roses), potted plants, foliage plants and a few selected vegetables. One of the above greenhouses also provided data on tomato production costs and returns. Nine greenhouses produced long-english cucumbers only, and one greenhouse producing mostly floral crops reported a small area under long-english cucumbers. According to the size of operation distribution, there were seven (7) greenhouses (33%) in the up to 19,999 square feet category (with an average area of 16,096 square feet), 10 greenhouses (48%) were in the range of 20,000 to 45,000 square feet, and the remaining four (4) greenhouses (19%) were in the more than 45,000 square feet category.

Average production costs and returns for the 1983-84 crop year, summarized according to region, crops produced, and the size of greenhouse operation are presented in Table 24. The major production costs were labour (hired, operator and family), material inputs, and greenhouse fuel. The relative share of these costs of the total production costs for the study sample were 36 per cent, 17 per cent, and 10 per cent, respectively. Other significant cost items were interest costs, repairs and maintenance, and marketing costs.

Average production costs for a greenhouse operation during the 1983-84 crop year amounted to $255,735 or $7.46 per square foot with an estimated gross revenue of $248,602 per greenhouse or $7.26 per square foot. Average production costs were somewhat higher for operations in north and north-central Alberta (Group I) when compared to those in south and south-central Alberta (Group II). Total production costs averaged $7.63 per square foot for Group I versus $7.33 per square foot for Group II. Gross revenue per square foot of greenhouse area was $7.30 for Group I compared with $7.22 for Group II. Greenhouses in Group I showed higher returns over operating costs ($2.02 per square foot) than Group II greenhouses ($1.80 per square foot). The average return over operating costs for the study sample was $1.84 per square foot. Average return to management was negative at 33¢ per square foot for Group I greenhouses and 11¢ per square foot for greenhouses in south and south-central Alberta (Group II). Average return to management for the study sample was negative at 21¢ per square foot.

The greenhouses producing combination crops showed substantially higher costs and net returns compared to greenhouses producing mainly vegetables (cucumbers and tomatoes). Gross revenue for greenhouses producing combination crops and vegetables was $7.33 and $4.54 per square foot, respectively. Return over cash costs for the combination crop growers was $1.82 per square foot compared to $1.96 per square foot for vegetable producers. Average return to management was positive for the combination crop group at 10¢ per square foot. For the

TABLE 24

SUMMARY OF GREENHOUSE PRODUCTION COSTS AND RETURNS, 1983-84

Items	Study Sample	Regions		Crops Produced		Size of Operation		
		Group I	Group II	Bedding Plants & Flowers	Vege-tables	up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over
Number Surveyed	21	9	12	14	11	7	10	4
Average Area (Sq Ft)	34263	35739	33155	35150	21169	16096	23947	91843
Gross Revenue ($)	248601.94	261038.87	239274.25	257639.19	96190.44	89773.00	134498.69	811810.75
Gross Revenue/Sq Ft ($)	7.26	7.30	7.22	7.33	4.54	5.58	5.62	8.84
OPERATING COSTS								
Material Inputs	43844.33	52494.55	37356.66	51598.86	6021.82	17740.00	22662.70	142481.00
Hired Labour	55439.81	56170.22	54892.00	62086.86	7813.91	2438.57	14286.60	251075.00
Greenhouse Fuel	24560.95	35326.78	16486.58	22758.14	9607.82	11783.71	14481.00	72121.00
Other Operating Costs	58817.03	44705.32	69401.01	57343.45	31344.58	26108.81	37541.32	169248.00
TOTAL OPERATING COSTS	182662.12	188696.87	178136.25	193787.31	54788.13	58071.09	88971.62	634925.00
Operating Costs/Sq Ft ($)	5.33	5.28	5.37	5.51	2.59	3.61	3.72	6.91
OTHER COSTS								
Land, Building, and Equipment Interest, & Depreciation ($)	36669.79	46733.74	29121.82	34198.25	15166.73	14130.79	18791.34	120809.22
Operator's Labour ($)	36402.71	37367.00	35679.50	26132.57	28431.45	27920.00	37534.20	48418.75
TOTAL OTHER COSTS ($)	73072.25	84100.75	64801.30	60330.83	43598.16	42050.77	56325.52	169227.94
TOTAL PRODUCTION COSTS ($)	255734.81	272797.85	242937.53	254118.50	98386.12	100121.87	145297.06	804153.00
TOTAL PRODUCTION COSTS/Sq Ft ($)	7.46	7.63	7.33	7.23	4.65	6.22	6.07	8.76
RETURN OVER OPERATING COSTS/Sq Ft ($)	1.92	2.02	1.84	1.82	1.96	1.97	1.90	1.93
RETURN TO MANAGEMENT/Sq Ft ($)	(0.21)	(0.33)	(0.11)	0.10	(0.11)	(0.64)	(0.45)	0.08

Group I is North and North Central Regions (3, 4, 5 and 6).
Group II is South and South Central Regions (1 and 2).

vegetable producing group, average return to management was negative at 11¢ per square foot. The above results indicate that diversified greenhouse operations, i.e., producing more than one crop offered a better return over investment than a single crop.

To develop production costs and returns the study sample was divided into groups representing different sizes of greenhouse operations. Total costs ranged from $5.62 per square foot for the intermediate sized greenhouse operations to $8.76 per square foot for large operations. In contrast, gross revenue averaged $8.84 per square foot for the large operations, $5.62 per square foot for the intermediate class, and $5.58 per square foot for the small operations. Return over operating costs was higher for the small operations ($1.97/sq ft), i.e. with an area up

to 19,999 square feet, followed by the large operations ($1.93/sq ft) and the intermediate ones ($1.90/sq ft). Return over operating costs for the study sample was $1.92 per square foot.

In terms of return to management (profit), only the large greenhouse operations showed a positive return to management. Estimated profit was $7,658 per greenhouse or eight (8) cents per square foot. The estimated return to management for the other two classes was negative at 64¢ per square foot for the small sized greenhouse operations and 45¢ per square foot for the intermediate sized operations. Return to management for the study sample was also negative at 21 cents per square foot.

Average operating and investment costs for the 1983-84 crop year have been summarized according to regions, crops produced, and the size of operation and are presented in Table 24.

Summary of Findings

Findings of the study are as follows:

i) Greenhouses surveyed for the 1983-84 crop year showed a consider able variation in structure, i.e., glass, fibreglass, and plastic. The structure of the greenhouses surveyed in the north and north central Alberta, consisted of plastic (32%), fibreglass (52%) and glass (16%). In the south and south-central regions, the greenhouse structures were glass at 74%, fibreglass at 22% and plastic 4%. Over the years, more fibreglass and plastic have been used in the construction of greenhouses. When both groups were combined, i.e., north/north-central regions and south/south-central regions, greenhouses for the study sample were 49 per cent glass, 35 per cent fibreglass, and 16 per cent plastic.

ii) The study results showed that overall costs and returns were relatively higher for greenhouses in north/north-central Alberta when compared to the greenhouses in south/south-central Alberta. The major reason for the higher costs and returns for operations in Group I could be diversification which incurred higher costs.

iii) The results of the 1983-84 survey of the greenhouse industry revealed that greenhouses producing combination crops, i.e., bedding plants, mums, poinsettias, and roses, etc., showed a much higher gross return than that received by operations only growing vegetables.

iv) Greenhouse operations in north/north-central Alberta showed a loss of 33 cents per square foot compared to a loss of 11 cents per square foot for greenhouses in south/south-central Alberta.

v) Greenhouse operations with a larger production area and retailing facilities showed a positive return to management of eight (8) cents per square foot whereas the other two groups showed negative returns to management.

vi) The cost of energy, a major concern of greenhouse operators, amounted to 13.5 per cent of the total operating costs in the study sample. It was 19 per cent for Group I participants (north and north-central Alberta) and about nine (9) per cent for Group II participants (south and central Alberta).

The Primary Producers' Energy Rebate Program was very much appreciated by all producers, as the assistance was very timely in reducing greenhouse heating costs. Some of the larger operations expressed concern regarding the maximum limit of the rebate. Several operations suggested that the rebate under this program be tied to the overall utilization of natural gas and that assistance under this program should be increased and continued indefinitely. The program is due to expire on December 31, 1985.

vii) Farmers' markets in cities and towns are serving a very useful purpose in the marketing of fresh greenhouse produce, especially bedding plants.

viii) A few growers thought that the provincial government field crops hail insurance program should be extended to greenhouse crops as well.

ix) Incentives should be provided for modernization and expansion of the greenhouse industry in Alberta.

x) Seasonal tariffs should be increased to protect the domestic industry from ever increasing imports of fresh produce (See Figure 5).

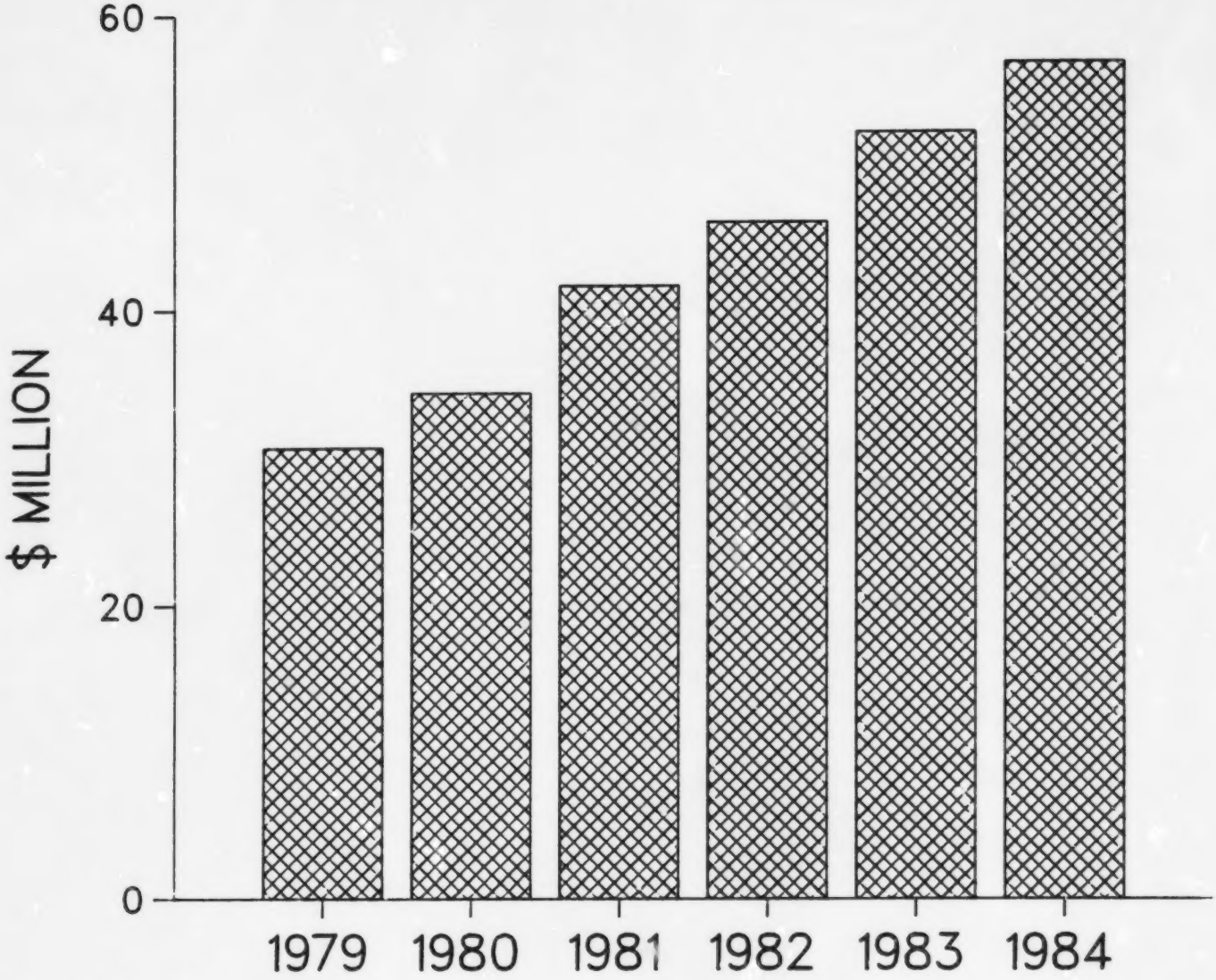

FIGURE 5: IMPORTS OF FRESH VEGETABLES TO ALBERTA, 1979-84